Schlumberger

1 , RUE NIEUPORT - 78 VELIZY-VILLACOUBLAY
Tél. 946 96 50 ■ Télex SIS VIL 69 201

CEDEX 38-75 PARIS BRUNE

# INSTRUCTION MANUAL

## OPTICAL UV RECORDER

## OM 4501

EDITION : SEPTEMBER 1971

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_11403

CONTENTS


| | | Page |
|---|---|---|
| 1. | GENERAL | |
| | 1.1 Operating principle | 1.1 |
| | 1.1.1 Paper drive system | 1.1 |
| | 1.1.2 Optical system | 1.1 |
| | 1.1.2.1 Light sources | 1.2 |
| | 1.1.2.2 Galvanometers type OM 4517 | 1.2 |
| | 1.1.2.3 OG 5507 event markers | 1.2 |
| | 1.1.3 Power supply | 1.2 |
| | 1.1.4 Controls | 1.2 |
| | 1.1.5 Trace number discriminator | 1.3 |
| | 1.1.6 Galvanometer ancillary units | 1.3 |
| | 1.1.6.1 Passive matching units type OM 4510 | 1.3 |
| | 1.1.6.2 Amplifier type OM 4509/0 | 1.3 |
| | 1.1.6.3 Power supply unit type OM 4508/0 | 1.4 |
| | 1.1.6.4 Remote control unit type OM 4511/0 | 1.4 |
| | 1.1.6.5 Slide cradle type OM 4524/0 | 1.4 |
| | 1.1.6.6 Transportation cradle type OM 4512/0 | 1.4 |
| | 1.1.7 Access to the different units | 1.4 |
| | 1.2 Specification | 1.4 |
| | 1.2.1 General characteristics | 1.4 |
| | 1.2.2 Measurement characteristics | 1.6 |
| 2. | DESCRIPTION | 2.1 |
| | 2.1 Figure 1 - General view | 2.1 |
| | 2.2 Figure 2 - Internal view (from above) | 2.2 |
| | 2.3 Figure 3 - Rear panel and ancillary units | 2.3 |
| | 2.4 Figure 4 - Paper Compartment and drive | 2.4 |
| | 2.5 Figure 5 - Setting up the optical system | 2.5 |
| | 2.6 Figure 6 - Loading the paper | 2.6 |
| | 2.7 Figure 7 - Fitting the UV lamp | 2.7 |
| | 2.8 Figure 8 - Bottom view | 2.8 |
| 3. | OPERATION | 3.1 |
| | 3.1 Drive system | 3.1 |
| | 3.1.1 Drive motor | 3.1 |
| | 3.1.2 Electromagnetic gearbox | 3.1 |
| | 3.1.3 Transport rollers | 3.2 |
| | 3.1.4 Paper transport | 3.2 |

CONTENTS (contd)


| | | Page |
|---|---|---|
| 3.2 | Optical system | 3.2 |
| 3.2.1 | Optical diagram | 3.2 |
| 3.2.1.1 | Parameter recording data | 3.2 |
| 3.2.1.2 | Lining recording circuit | 3.2 |
| 3.2.1.3 | Time recording circuit | 3.3 |
| 3.2.1.4 | Electromagnetic marker signal recording circuit | 3.3 |
| 3.2.1.5 | Spot number recording circuit | 3.3 |
| 3.2.2 | Power supply for the light sources | 3.3 |
| 3.2.2.1 | Power supply for the mercury vapour lamp | 3.3 |
| 3.2.2.2 | Power supply for the flash lamp: timebase | 3.4 |
| 3.2.3 | Spot display | 3.4 |
| 3.2.4 | Trace discrimination | 3.5 |
| 3.2.4.1 | Cyclic interruption | 3.5 |
| 3.2.4.2 | Trace numbering in the margin | 3.5 |
| 3.2.5 | Marker pip plotting | 3.5 |
| 3.3 | Matching the parameters | 3.5 |
| 3.2.1 | Matching units | 3.5 |
| 3.3.2 | Amplifier type OM4509/0 | 3.6 |
| 3.3.3 | Amplifier power supply type OM4508/0 | 3.7 |
| 4. | SETTING UP AND OPERATION | 4.1 |
| 4.1 | Setting up | 4.1 |
| 4.1.1 | Fitting the galvanometers | 4.1 |
| 4.1.2 | Fitting the matching units | 4.1 |
| 4.1.3 | Fitting the amplifiers | 4.1 |
| 4.1.4 | Loading the paper | 4.1 |
| 4.2 | Setting up the optical section | 4.2 |
| 4.2.1 | Setting up the mercury vapour lamp | 4.2 |
| 4.2.2 | Setting up the galvanometers | 4.2 |
| 4.3 | Setting up the ancillaries | 4.3 |
| 4.3.1 | Setting up the zero of the amplifiers | 4.3 |
| 4.3.2 | Calibrating the amplifiers | 4.4 |
| 4.3.3 | Set ting up the matching units | 4.4 |
| 4.3.3.1 | Matching unit type OM4510/1 | 4.4 |
| 4.3.3.2 | Matching unit type OM4510/2 | 4.4 |
| 4.3.3.3 | Matching unit type OM4510/0 | 4.5 |

CONTENTS (Contd)


| | | Page |
|---|---|---|
| 4.4 | Identification of input connections | 4.5 |
| 4.5 | Earth points available | 4.5 |
| 4.5.1 | Main earth of the recorder | 4.5 |
| 4.5.2 | Screening | 4.5 |
| 4.6 | Analysis of the recording | 4.6 |
| 4.7 | Conserving the traces | 4.6 |
| 4.8 | Fitting the optical items | 4.6 |
| 4.8.1 | Fitting the timebase | 4.6 |
| 4.8.1.1 | Fitting the board | 4.6 |
| 4.8.1.2 | Fitting the flash lamp | 4.6 |
| 4.8.2 | Fitting the amplifier power supply sub-unit | 4.7 |
| 4.8.3 | Fitting the discriminator | 4.7 |
| 5. | MAINTENANCE | 5.1 |
| 5.1 | Cleaning the recorder | 5.1 |
| 5.2 | Lubricating the gearbox | 5.1 |
| 5.3 | Renewing the lamps | 5.1 |
| 5.3.1 | Renewing the UV lamp | 5.1 |
| 5.3.2 | Renewing the flash lamp | 5.2 |

# GENERAL

## 1. GENERAL

The portable UV recorder type OM4501 is used for the simultaneous recording of 8 parameters, in Cartesian coordinates, on daylight-printing paper. It is compact, portable and can be remotely controlled.

The recorder features:

(a) 8 recording channels employing "pencil" type mirror galvanometers.
(b) 8 recording speeds with remote control.
(c) 8 high input impedance amplifiers which allow the oscillographs to be matched without the need for calculating impedances or damping.
(d) Measurement references that are independent of paper travel.
(e) The capability of remote control.
(f) Ease of access to the different items such as light sources, galvanometers, etc.

### 1.1 Operating Principle

The traces from the beams of light are recorded on an emulsion which is sensitive to ultraviolet rays. After exposure to daylight, the traces appear without chemical processing.

Several sub-assemblies contribute to the recording described above:

(a) The drive system
(b) The optical system
(c) The power supply
(d) The controls
(e) The ancillaries

#### 1.1.1 Paper Drive System

The paper drive system incorporates:

(a) A paper feed device, formed by a capstan, a pinch roller and a drive roller.
(b) A motor for driving the feed device.
(c) An electromagnetically controlled gearbox which determines the different paper speeds.

#### 1.1.2 Optical System

This comprises:

(a) The light sources
(b) The galvanometers
(c) The electromagnetic signals.

1.1.2.1 Light Sources

(a) A high pressure mercury vapour lamp is used for recording the parameters, for making the millimetric lines and for identifying the traces. This lamp is protected by a cover, the dimensions of which are calculated to ensure correct cooling.
A high efficiency stabilized supply provides the power for operating this lamp.

(b) A rectilinear flash lamp is used for marking the time. It is controlled by a coded timebase.

1.1.2.2 Galvanometers Type 0M4517

These are moving coil instruments with a low internal resistance and are damped by an external shunt for the versions with a low fundamental frequency and by oil for the versions with a higher fundamental frequency.

Their "pencil" shape enables several of them (up to 8) to be grouped in a common magnetic block.

1.1.2.3 0G5507 Event markers

Two electromagnetic marker signals (24V, 15mA), controlled by contact closure, enable a sequence to be marked. They are remote controlled (connector marked "CD"). One of these signals can be controlled locally by a push-button at the rear of the instrument.

1.1.3 Power Supply

The recorder is powered from the mains via a power supply board fitted internally, with the transformer located at the rear. This board provides the voltages required for operating the timebase light sources, the switching logic and the unit which supplies the amplifiers. The motor is supplied from the mains, via a relay.

1.1.4 Controls

These are grouped on a control panel on top of the instrument and include:

(a) The recorder "on" switch
(b) The motor start switch
(c) Selector switches for the 4 basic speeds
(d) A switch which is used for obtaining 2 speeds with a ratio of 100:1 at each of 4 of the basic speeds.

(e) A push-button for loading the paper.

The last four controls affect the paper drive system by means of a "switching logic" circuit.

Only the local control for one of the two electromagnetic signals is located on the rear panel of the recorder.

1.1.5 Trace Number Discriminator

This is a device for the cyclic interruption of the primary light beam with marginal recording of the number of the galvanometer masked.

1.1.6 Galvanometer Ancillary Units

1.1.6.1 Passive Matching Units Type OM4510

These units are used for attenuating, standardizing and damping the galvanometers. Three types of matching unit are provided:

OM4510/1: For galvanometers with electromagnetic damping

OM4510/2: For galvanometers with oil damping

OM4510/0: No damping fitted; for special installations to be set up by the user.

1.1.6.2 Amplifiers Type OM4509/0

These amplifiers are used for double isolation of the input circuits and for matching the signals to the galvanometers, without calculating the impedance or damping. Their gain, which can be adjusted from 1 to 120, provides a maximum overall sensitivity of 2 and 10mV/cm with the galvanometers type OM4517/2 and OM4517/3.

Each amplifier has a zero adjustment but these are only used with oil-damped galvanometers.

They are connected at the rear of the recorder, in a special compartment, to a power supply which supplies the requisite voltages from the main power supply for the instrument. Each amplifier is fitted with a 4-pin 41.524 connector for connecting the input parameters.

1.1.6.3 Power Supply Unit Type OM4508/0

This is itself supplied from the 24V supply provided by the recorder. Six miniature banana sockets are provided for connecting each amplifier, i.e. a total of 48 sockets for the set of 8 amplifiers.

Reference voltages. Three reference voltages, 10mV, 100mV and 1000mV, are available at banana sockets and are used for calibrating the amplifiers.

1.1.6.4 Remote Control Unit Type OM4511/0

This unit allows the user to obtain the following functions up to a maximum distance of 5 metres:

(a) Motor start/stop

(b) Control of the two paper speeds, in the ratio 100 to 1, selected beforehand on the control panel.

(c) Marking a sequence by the control of the event markers.

1.1.6.5 Slide Cradle Type OM4524/0

This cradle is used for mounting the recorder in a rack.

1.1.6.6 Transportation Cradle Type OM4512/0

This cradle enables the recorder to be used in a vehicle.

1.1.7 Access to the Different Units

A drilled rear flap provides access to the UV lamp, as well as for fitting and setting up the galvanometers.

A loading flap at the front of the recorder gives access to the paper compartment.

1.2 Specification

1.2.1 General Characteristics

Drive System

Synchronous induction motor

Electromagnetic gearbox

8 paper speeds obtained by switching as follows:

| Speeds | mm/s | | | |
|---|---|---|---|---|
| Slow (ratio of 1) | 0.25 | 1 | 2.5 | 10 |
| Fast (ratio of 100) | 25 | 100 | 250 | 1000 |

Paper speed accuracy: better than 2%

Time for changing from 10 to 1000mm/s: less than 0.1s

Remote Control

Motor start and stop

Switching the speeds in the ratio of 100 to 1

Marker pips

Recording Paper

Daylight printing paper: internal emulsion

Width: 152mm

Length: 45mm

Force: 100g/$m^2$

4-roller unit: 0M4502/0

Timebase

Line coded along the abscissa

Timebase: 0.01s, 0.1s, 1s and 10s, automatically selected according to the paper speed

Ordinate lining: every 5mm with a thicker line every 25mm.

Trace Number Discriminator

Light Sources

50W high-pressure mercury vapour lamp: supplied with constant power
Provides pin-hole beam for the galvanometers, markers and longitudinal lining system

Flash lamp: Powered by the 50Hz mains supply via a frequency divider;
Provides the flash source for the timebase.

Dimensions

Length: 400mm

Depth: 500mm

Height: 160mm

Weight

15 to 19kg depending on the equipment fitted.

## 1.2.2 Measurement Characteristics

### Examples of Input Levels

| Input Levels | Impedance (ohms) | Galva-nometer | Amplifier | Matching Unit | Application |
|---|---|---|---|---|---|
| 2mV/cm to 0.2V/cm | 100k | 1000Hz | OM4509/0 | | Standard FM,IRIG,BP |
| 10mV/cm to 1V/cm | 100k | 1800Hz | OM4509/0 | | Standard FM,IRIG,BC |
| 0.8V/cm to 8V/cm | 0.5 to 5k | 1000Hz | | OM4510/2 | Electromechanical |
| 3.3V/cm to 33V/cm | 0.5 to 5k | 1800Hz | | OM4510/2 | Industrial electricity |
| 40µA/cm | 1k | 100Hz | | OM4510/1 | S.I.S. test transducers |
| 20mV/cm | 0.5k | 100Hz | | OM4510/1 | Power measurements across a shunt |
| 50 to 500 mV/cm | 0.5 to 5k | 200Hz | | OM4510/1 | Industrial electricity |

### General Recording Characteristics

Nominal elongation: ±50mm

Spot definition: not greater than 0.4mm

Hysteresis: typical less than 1%, guaranteed less than 2%

Linearity: typical less than 1%, guaranteed less than 2%.

### Oscillographs

| Type | OM4517/2 | OM4517/3 | OM4517/0 | OM4517/1 |
|---|---|---|---|---|
| Frequency | 1000Hz | 1800Hz | 100Hz | 200Hz |
| Identification | Black | Green | Red | Yellow |
| Internal resistance | 70 ohms | 62 ohms | 60 ohms | 65 ohms |
| Sensitivity coefficient | 1.65mA/cm | 6.65mA/cm | 25µA/cm | 96µA/cm |
| Maximum current | 50mA | 50mA | 2mA | 5mA |
| Bandwidth to ±5% | 600Hz* | 1000Hz* | 60Hz | 120Hz |
| Damping | Oil | | External electro-magnetic resistance 120 ohms | |
| *The nominal bandpass characteristics are given for an ambient temperature of between +20°C and +30°C inclusive. | | | | |

### EVENT MARKERS

Operation: Contact closure

Local marker control

Amplifier

Isolation: Channel to channel and channel to earth, greater than 100 megohms/100V

Common mode voltage : 100 V r.m.s.50Hz

Input impedance: 100 kilohms

Differential input capacitance: approximately 75pF

Input capacitance with respect to the shield : approximately 50pF

Maximum slope: 0.8mA/mV

Gain: adjustable from 0.9 to 120

Maximum input voltage: 10V

Maximum output current:

(a) Linear: 30mA

(b) Saturation: 35 to 40mA

Bandwidth to ±1% : 0 to 2000Hz

Common mode rejection: 1000dB at 50Hz

Amplifier Supply Unit

This unit is common to all the amplifiers and is supplied with 24V. It is used for checking the electrical zero of the galvanometers and generates the reference voltages.

Reference voltages available: 10, 100 and 1000mV

Accuracy: ±1%.

Matching Units

For attenuation, standardization or damping of the galvanometers.

(a) OM4510/1: For galvanometers with electromagnetic damping (see table of input levels in para 1.2.2)

(b) OM4510/2: For galvanometers with oil damping (see table of input levels in para 1.2.2)

(c) OM4510/0: For special matching arrangements; to be fitted by the user.

Electrical Connections

(a) 220V, 50Hz mains supply: via a "Swiss" type connector and 2-metre long mains lead.

(b) Maximum power: 175VA

(c) Remote control: via a 6-pin JAEGER connector

(d) Input of the 8 measurement channels

Direct and to the matching unit: via 4mm diameter banana sockets spaced 19mm apart

To the amplifiers: input plug and screened twisted 2-core cable supplied with each amplifier. Length of cable: 2 metres

(e) 24V outputs: Two 24V, 150mA d.c. outputs via 4mm diameter banana sockets, for supplying the transducer ancillaries.

(f) Reference voltage output: via 4mm diameter banana socket.

Accessories

(a) Remote Control Unit type OM4511/0: unit in a case with 5 metres of cable

(b) Rack mounting type OM4524/0: cradle with slides

(c) Transport mounting type OM4512/0: suspended cradle

(d) Accessory case type OM4513/0: with adjustable compartments which holds:

(i) The operating manual
(ii) A box containing 4 rolls of recording paper
(iii) 18 galvanometers in cases
(iv) 3 spare lamps in cases
(v) Remote Control Unit
(vi) Cables and accessories

Dimensions:
400mm x 130mm x 350mm

# PHYSICAL DESCRIPTION

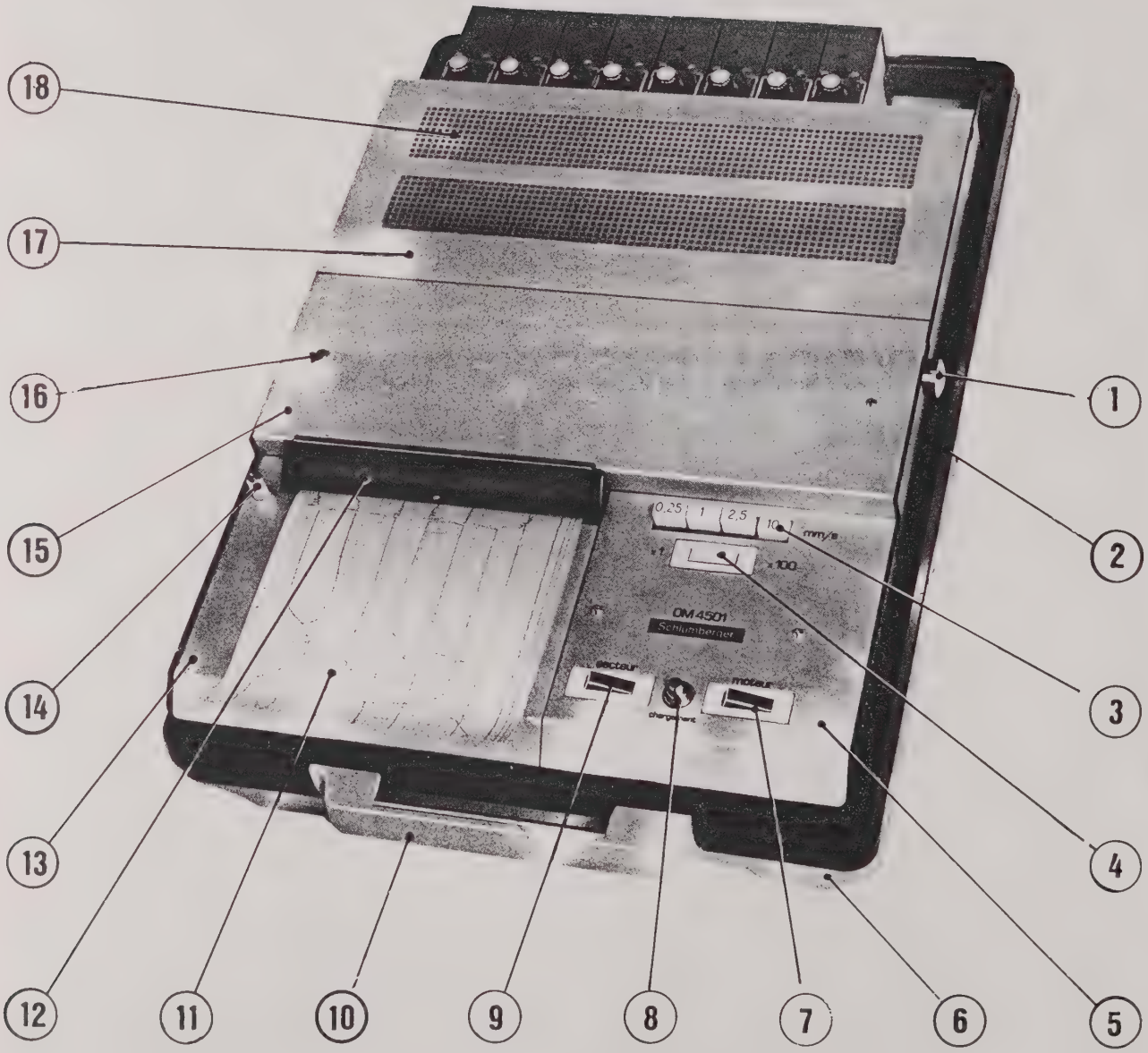

18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0.25
1
2.5
10
mm/s
x1
x100
OM 4501
Schlumberger
secteur
moteur

Fig .1

## 2. DESCRIPTION

2.1 Figure 1 General view

Ref 1 - Push-button for removing the cover from the recorder

Ref 2 - Sealing strip 9103 0103 26 FF (8/77)

Ref 3 - Selector switch for the 4 basic speeds

Ref 4 - Selector switch for the 100:1 ratio of the two speeds

Ref 5 - Control panel

Ref 6 - Bottom cover of the recorder

Ref 7 - Motor start switch

Ref 8 - Loading push-button

Ref 9 - Mains switch

Ref 10 - Retractable carrying handle

Ref 11 - Recorded paper

Ref 12 - Display shade 9133 0809 — 18 FF (8/77)

Ref 13 - Access flap to the paper compartment

Ref 14 - Button for opening the access flap

Ref 15 - Top panel 9123 0617 121 AF (8/77)

Ref 16 - Top panel fixing screw

Ref 17 - Access flap to the light source and to the galvanometers

Ref 18 - Ventilation holes

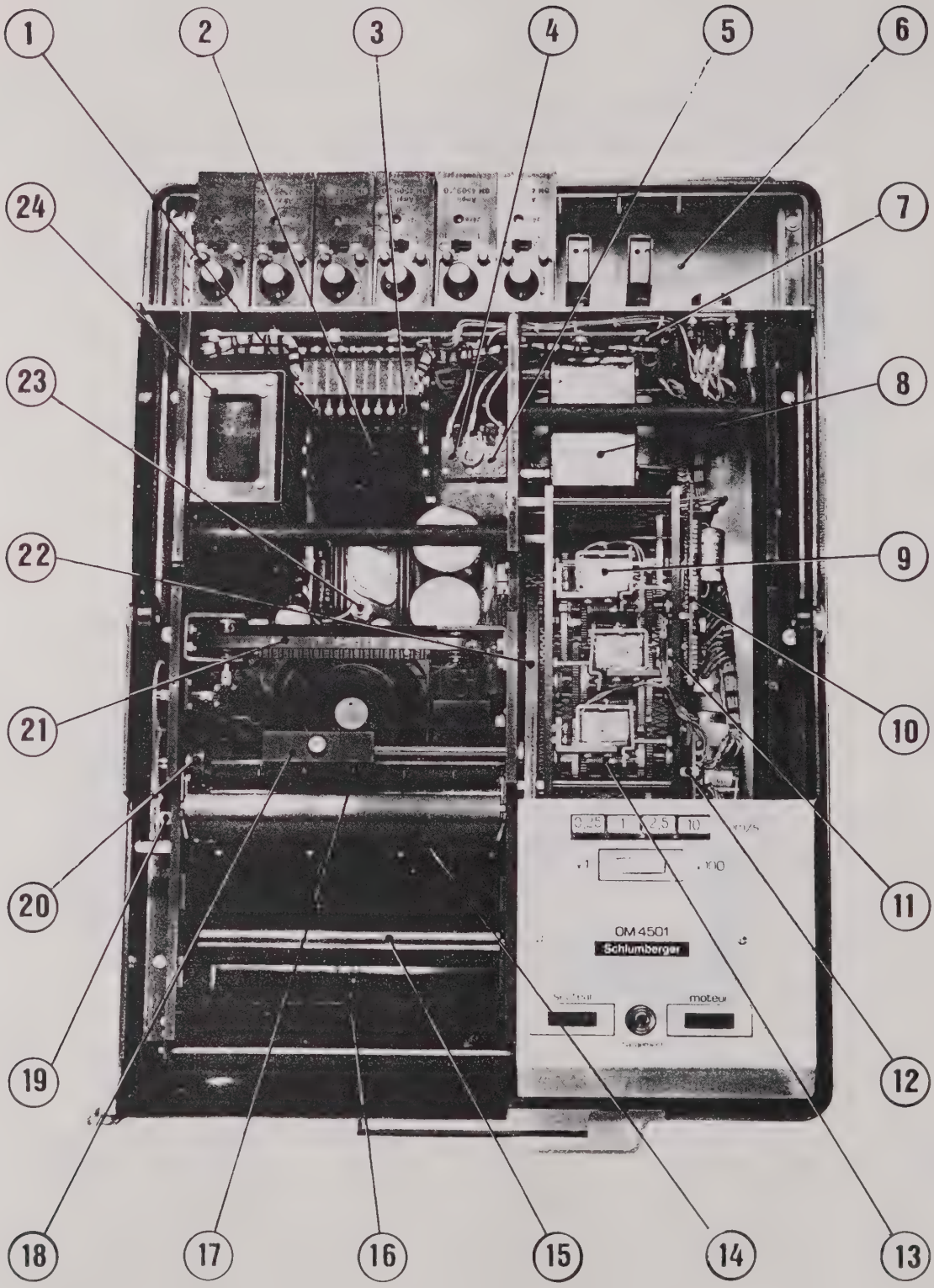

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
OM 4501
Schlumberger

Fig.2

2.2 Figure 2 Internal View (from above)

Ref 1 - Galvanometer for channel No.1

Ref 2 - Magnetic unit

Ref 3 - Galvanometer for channel No.8

Ref 4 - Electromagnetic marker signal No.2 (SP2)

Ref 5 - Electromagnetic marker signal No.1 (SP1)

Ref 6 - Housing for the amplifiers

Ref 7 - Plate for interconnecting the galvanometers to the input terminals

Ref 8 - Power supply transformer

Ref 9 - Electromagnets

Ref 10 - Timebase board

Ref 11 - Gearbox plate used for mounting the timebase board

Ref 12 - "Switching logic" board

Ref 13 - Gearbox clutch spring

Ref 14 - Capstan

Ref 15 - Shaft for spool of paper

Ref 16 - Spool extraction plate

Ref 17 - Spot locating marks

Ref 18 - Mounting for the intermediate mirror for the beam for recording the parameters

Ref 19 - Capstan pinion

Ref 20 - Trace numbering device

Ref 21 - Trace discriminator belt

Ref 22 - Gearbox drive belt

Ref 23 - Power supply board

Ref 24 - Housing for the UV light source

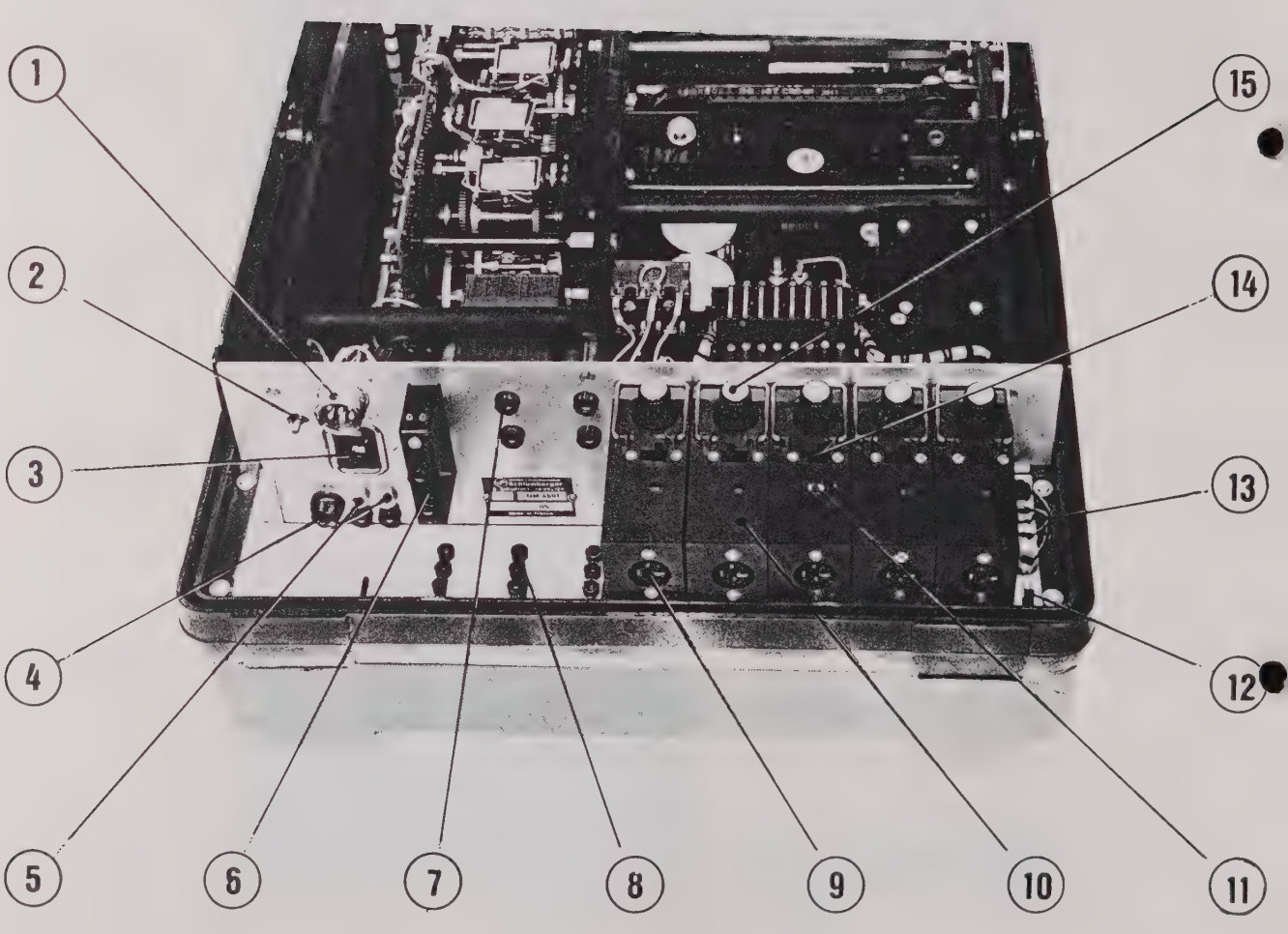



Fig .3

2.3 Figure 3 Rear Panel and Ancillary Units

Ref 1 - Remote control input plug

Ref 2 - Push-button for local marker control (SP1)

Ref 3 - Mains connector

Ref 4 - 1A mains fuse

Ref 5 - 24V output sockets

Ref 6 - Matching Unit type OM4510

Ref 7 - Direct input sockets

Ref 8 - Amplifier plug-in sockets

Ref 9 - Amplifier input connector

Ref 10 - Amplifier type OM4509

Ref 11 - Aperture for access to the potentiometer for zeroing the amplifiers

Ref 12 - "Galvonometer zero" switch

Ref 13 - Output sockets for the reference voltages

Ref 14 - "X1 - X10" gain switch

Ref 15 - Potentiometer for fine adjustment of the gain

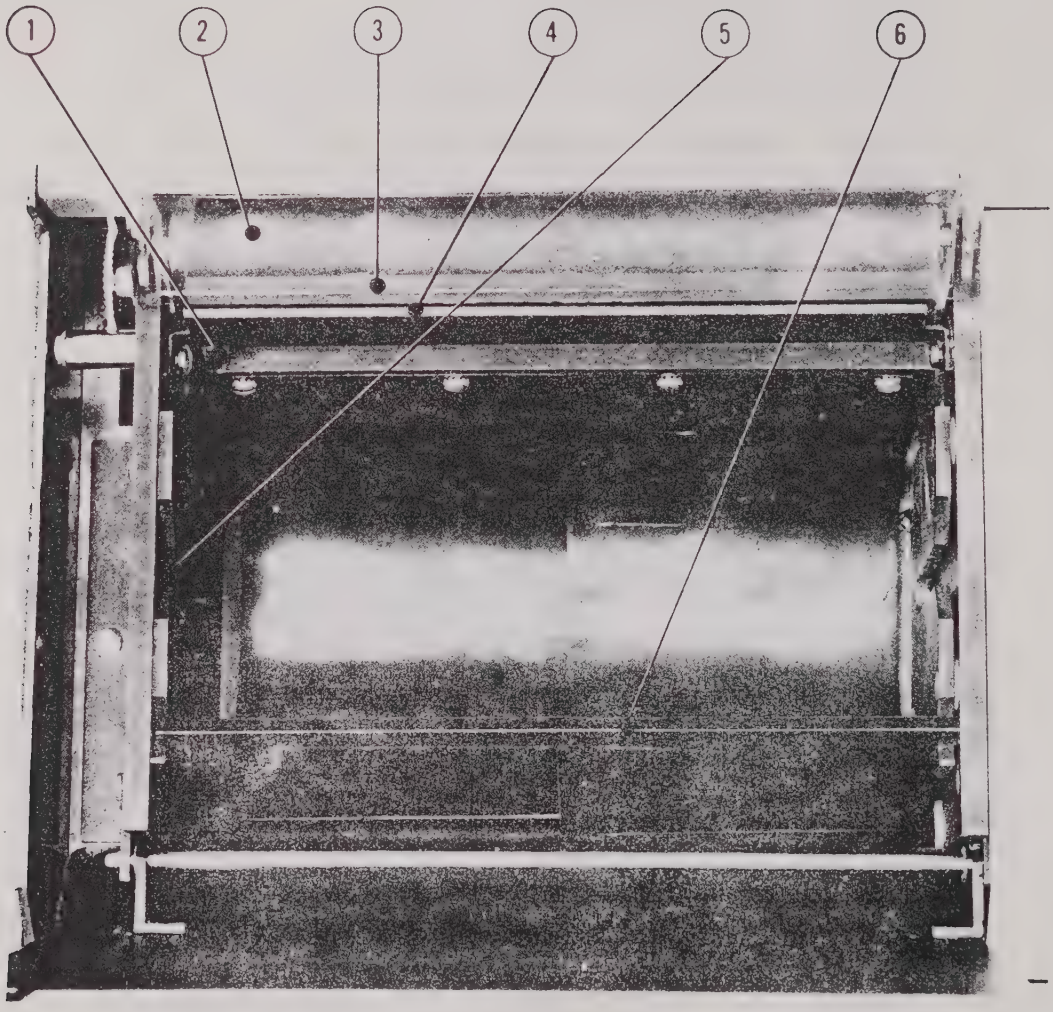



Fig : 4

2 - 4 Figure 4 - Paper compartment and drive

Ref 1 - "Capstan drive roller" intermediate roller

Ref 2 - Pinch roller

Ref 3 - Capstan

Ref 4 - Guide for to prevent paper's packing

Ref 5 - Place of shaft

Ref 6 - Extraction plate.

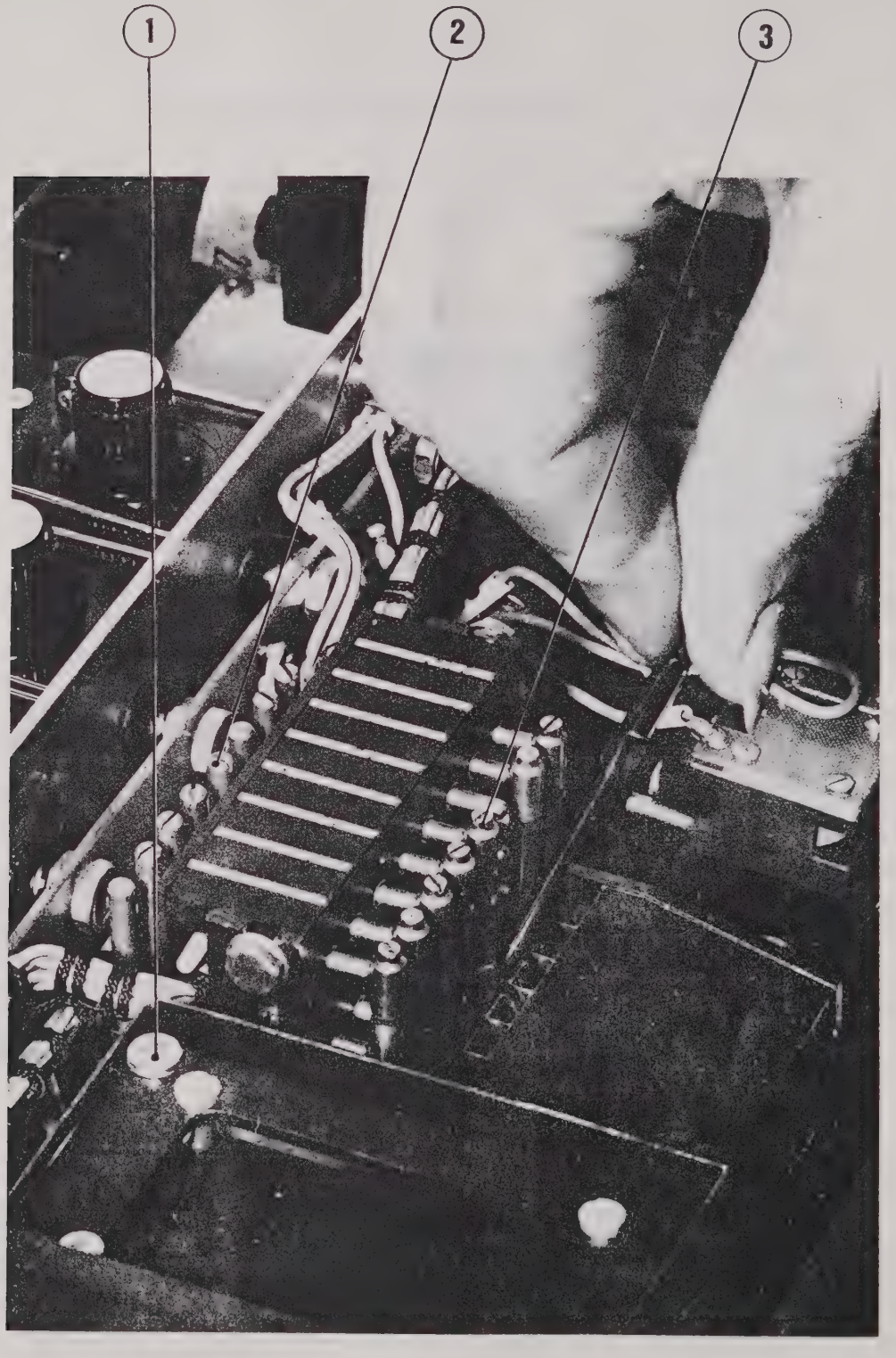



Fig.5

2.5 Figure 5 Setting up the optical system

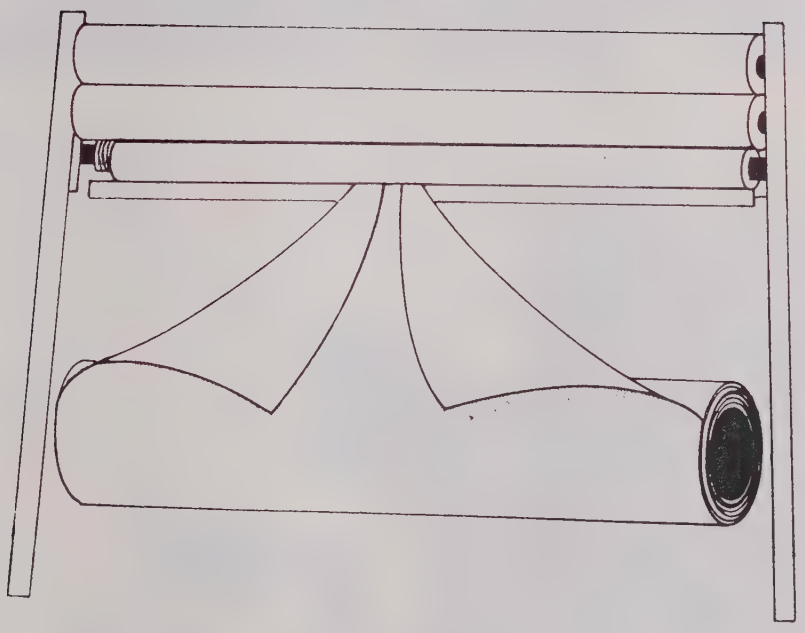
Ref 1 - Screw for adjusting the height of the UV source

Ref 2 - Screw for adjusting the elevation of the galvanometers

Ref 3 - Screwdriver slot for adjusting the bearing of the galvanometers

Fig. 6

2-6 Figure 6 - **Loading the paper**



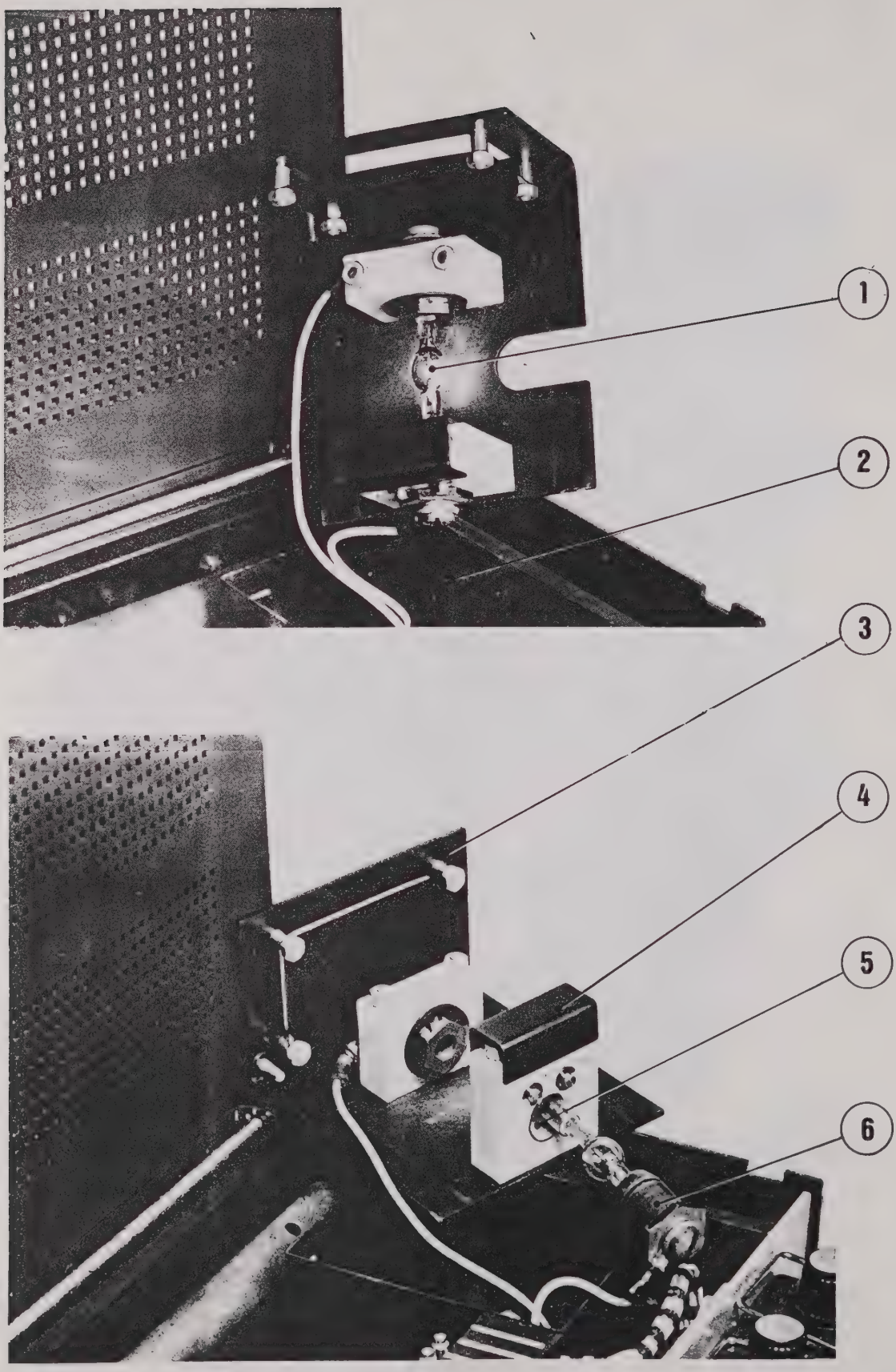



Fig -7

2.7 Figure 7 Fitting the UV Lamp

Ref 1 - 50W high pressure UV lamp

Ref 2 - Housing for the UV lamp

Ref 3 - UV lamp bracket

Ref 4 - Push-button for ejecting the UV lamp

Ref 5 - Hole for inserting the UV lamp

Ref 6 - Lower socket of the UV lamp

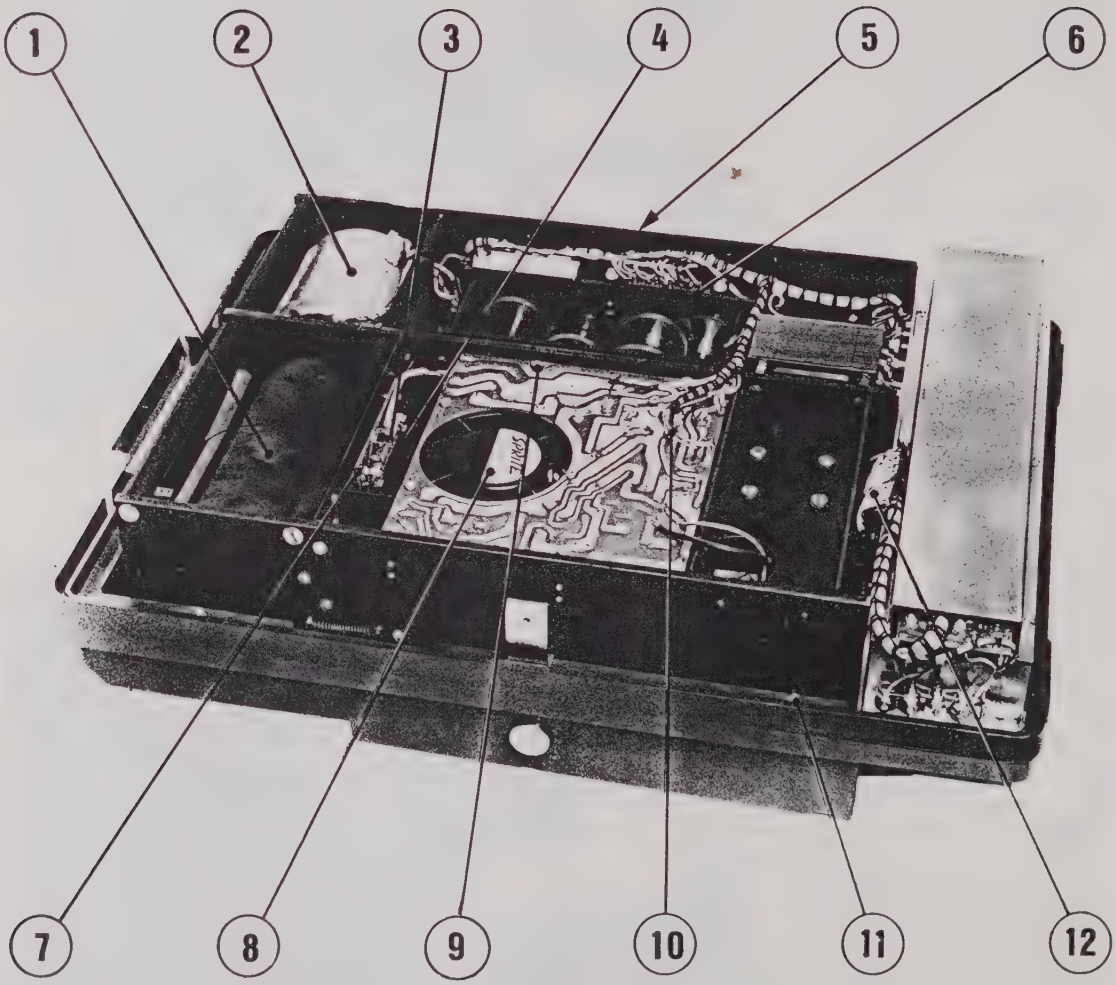



Fig.8

2.8 Figure 8 Bottom View

Ref 1 -- Extraction plate

Ref 2 - Drive motor

Ref 3 - Flash lamp

Ref 4 - Protective cover for the flash lamp

Ref 5 -- Right-hand side plate of the recorder

Ref 6 - Right-hand side plate of the gearbox

Ref 7 - Flash lamp mounting board

Ref 8 - Fan

Ref 9 - Light board fixing screw

Ref 10 - Light board 32037593 27351FF(8/77).

Ref.11 - Screw for securing the sealing strip

Ref 12 - Cable harness for connecting the power supply for the amplifiers.

# CIRCUIT DESCRIPTION

## 3. OPERATION

### 3.1 Drive System

The drive system comprises the following items:

(a) A motor

(b) A gearbox

(c) Paper transport rollers

#### 3.1.1 Drive Motor (Figure 8, Ref 2)

This is a single-phase synchronous induction motor with a starting capacitor and a power rating of 15W. It is connected to an electromagnetic gearbox and has a speed of rotation of 1500 r.p.m.

#### 3.1.2 Electromagnetic Gearbox

This allows the 8 paper speeds to be obtained from 8 ratios ranging from 2/3 for the maximum speed to 1/6000 for the minimum speed.

It is formed by gears and spring clutches, the latter being controlled by 3 electromagnets. The 8 gearbox ratios are obtained by using combinations of 1, 2 or 3 of these electromagnets.

These three electromagnets are supplied from a switching logic circuit and are controlled from a push-button keyboard and a changeover switch on the control panel.

The distribution of the electromagnets, which are operated in accordance with the selected speeds, is as follows:

| Keyboard | | | | Changeover Switch | | Speeds (mm/s) | Electromagnets | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.25 | 1 | 2.5 | 10 | 1 | 100 | | A | B | C |
| X | - | - | - | X | - | 0.25 | - | - | - |
| - | X | - | - | X | - | 1 | X | - | - |
| - | - | X | - | X | - | 2.5 | - | X | - |
| - | - | - | X | X | - | 10 | X | X | - |
| X | - | - | - | - | X | 25 | - | - | X |
| - | X | - | - | - | X | 100 | X | - | X |
| - | - | X | - | - | X | 250 | - | X | X |
| - | - | - | X | - | X | 1000 | X | X | X |
| Loading | | | | | | 100 | X | - | X |

3.1.3 Transport Rollers (Figure 4)

Three rollers are used for driving the paper:

(a) The capstan: connected to the drive system by means of a toothed belt

(b) The pinch roller: presses the paper onto the capstan

(c) The drive roller: connected to the capstan by means of a friction roller. This roller drives the paper and facilitates its positioning when loading.

The friction roller provides the link between the capstan and drive rollers and enables very slightly different speeds of rotation to be obtained. The drive roller rotates at a speed less than that of the capstan, to ensure correct paper tension.

3.1.4 Paper Transport (Figure 9)

The paper from the spool is routed under the drive roller and driven by the capstan. It then passes under the pinch roller and is taken to the outlet slot.

3.2 Optical System

3.2.1 Optical Diagram (Figure 9)

The traces are recorded on the sensitive paper by means of the recorder optical system described in para 1.1.2.

There are 5 separate circuits:

(a) Parameter recording circuit

(b) Lining circuit

(c) Time recording circuit

(d) Electromagnetic marker signal recording circuit

(e) Spot numbering circuit.

3.2.1.1 Parameter Recording Circuit

The light beam from the mercury vapour lamp strikes an intermediate mirror. The reflected ray then strikes the galvanometer mirror and, after being reflected a second time, strikes the sensitive paper.

3.2.1.2 Lining Recording Circuit

The lining is recorded by a fringe beam from the mercury vapour lamp. This beam strikes an engraved strip mounted on a bracket and strikes the paper at the points determined by the engraving.

The lining is recorded after the parameters. The trace is printed every 5mm with a thicker line every 25mm.

3.2.1.3 Time Recording Circuit

The flashes from the flash lamp are focussed by a cylindrical lens and strike the paper. The traces are recorded at right angles to the direction of paper travel.

The times are recorded before the parameters.

3.2.1.4 Electromagnetic Marker Signal Recording Circuit

The beam from the mercury vapour lamp is reflected first by the intermediate mirror, then by the mirrors for the two electromagnetic marker signals. This beam strikes the sensitive paper in the margin.

These signals are recorded simultaneously with the parameters.

3.2.1.5 Spot Number Recording Circuit

The beam from the mercury vapour lamp strikes the sensitive paper, in the margin, via a grid containing the numbers for the different galvanometers masked.

This numbering is recorded at the same time as the lining.

3.2.2 Power Supply for the Light Sources

3.2.2.1 Power Supply for the Mercury Vapour Lamp

The power supply operates on the switching principle and so ensures high efficiency. It has closed-loop control for constant power.

The mercury vapour lamp is run up to normal operating conditions in 3 successive stages:

(a) Ionisation

During switch-on, bias pulses of 4.5kV, obtained from a relaxation oscillator, are applied to the lamp. This circuit is inhibited as soon as the arc appears.

(b) Striking

The characteristics of the regulated power supply enable the lamp to be struck with a voltage of about 56V.

(c) Maintaining the arc

The power supply provides the lamp with a regulated voltage which is ensured by a chopper circuit controlled by a linear combination of the lamp voltage and output current.

An integrator circuit is connected between the regulating circuit and the lamp.

3.2.2.2 Power Supply for the Flash Lamp: Timebase

The flash lamp for marking the times is controlled by a coded timebase (Figure 10).

The driver section is supplied from the 50Hz mains which ensures an accuracy of 0.1%. The mains voltage is converted into square wave signals of frequency 100Hz. The square waves formed in this way are applied to 3 divide-by-10 networks, constituted by series connected integrated circuits. These circuits enable pulses with p.r.f.'s of 10Hz, 1Hz and 0.1Hz to be obtained. These pulses are then coded by a logic circuit. Thus they allow the times to be identified immediately from the paper.

The signals are amplified and then applied to the gate of a thyristor which is connected in series with a capacitor in the primary of a transformer. The pulses appearing at the secondary of this transformer (10 to 12kV) produce a flash of average duration 10 microseconds.

The time marking rate is a function of the selected speed.

| Speed (mm/s) | 0.25 | 1 | 2.5 | 10 | 25 | 100 | 250 | 1000 |
|---|---|---|---|---|---|---|---|---|
| Time (s) | - | 10 | 10 | 1 | 1 | 0.1 | 0.1 | 0.01 |

3.2.3 Spot Display

The spots are displayed through a shade, which stops the UV radiation, and by means of an intermediate mirror.

This display enables the spots to be positioned by means of the locating marks.

### 3.2.4 Trace Discrimination

#### 3.2.4.1 Cyclic Interruption

A belt with 4 masking spigots is driven by the capstan, via a set of pinions. The spigots interrupt the incident beam for lighting the galvanometers. This arrangement allows the traces to be identified in the same order for each cycle, regardless of the deflection of the galvanometers at the time of discrimination.

#### 3.2.4.2 Trace Numbering in the Margin

A grid containing the engraved numbers 1 to 8 is fitted on a drum that is integral with one of the drive pinions. The linear speed of the grid is equal to that of the paper travel, so as to obtain a clear image of the numbering.

The grid is positioned such that the interruption of the trace for galvanometer No.1 corresponds with No.1 of the grid and that the interruption of the trace for galvanometer No.8 corresponds with No.8 of the grid. Thus the galvanometers are identified by their order number.

Each trace is interrupted every 10cm along the paper.

### 3.2.5 Marker Pip Plotting

These pips, which are supplied by the two electromagnetic marker signals, are used for identifying a sequence with respect to time.

The electromagnetic marker signals are located in the same optical plane as the galvanometer mirrors.

Supplied with 24V, they are controlled, either remotely by means of the Remote Control Unit, or locally by means of a push-button on the rear panel of the machine (Figure 3, Ref 2). Only one marker pip (SPk) is controlled in the latter case.

The sequences are marked in the opposite margin to that used for recording the spot numbers.

## 3.3 Matching the Parameters

### 3.3.1 Matching Units

These are used on the direct inputs of the galvanometers and are used for matching the input signals both as regards impedance and amplitude. They are contained in a compact casing (12mm x 52mm x 26mm) fitted with two input sockets and two output terminals.

Three models are provided:

(a) Type OM4510/1 for galvanometers with electromagnetic damping.

(b) Type OM4510/2 for galvanometers with oil damping.

(c) Type OM4510/0 for special applications to be performed by the user (basic casing fitted with input sockets, output terminals and a basic printed circuit).

NOTE: The power consumption of the oil-damped galvanometer type OM4517/3 reduces the operating range of the matching unit, since the power dissipated by the latter must not exceed 1W.

3.3.2 Amplifier Type OM4509/0

Each recording channel can be fitted with an amplifier which has as asymmetric input with a neutral point and featuring a high input impedance (100 kilohms).

This amplifier is formed by an integrated circuit followed by a power stage, these two together forming a series operational amplifier, the output current of which is proportional to the input voltage.

Two gain adjustments are provided:

(a) One, by means of a 2-position switch, allows the ratios "1" and "10" to be obtained.

(b) The other, by means of a potentiometer that can be adjusted progressively, allows ratios from 0.9 to 12 and from 9 to 120 to be obtained, according to the setting of the 2-position switch.

The amplifier can be set to the electrical zero by means of the potentiometer R5.

These adjustments can be made from the top of the amplifier.

A current limiter, formed by diodes CR5, CR6, CR7 and CR8, protects the galvanometers by limiting the output current to 35 or 40mA.

The amplifier is supplied with a constant voltage by means of the zener diodes CR3 and CR4.

The amplifier input is protected against overloading by the series resistor R32 and the diodes CR1 and CR2 which are connected in parallel at the input of the integrated circuit.

The amplifier is in a compact casing (30mm x 75mm x 80mm) and is connected to the power supply by 6 miniature sockets.

The input is via a 3-pin DIN 41 524 connector. The amplifier unit is screened and the screening is isolated from earth and connected to the third pin of the input connector.

The casing (screen) is covered with an epoxy paint which protects the operator during a high common mode measurement.

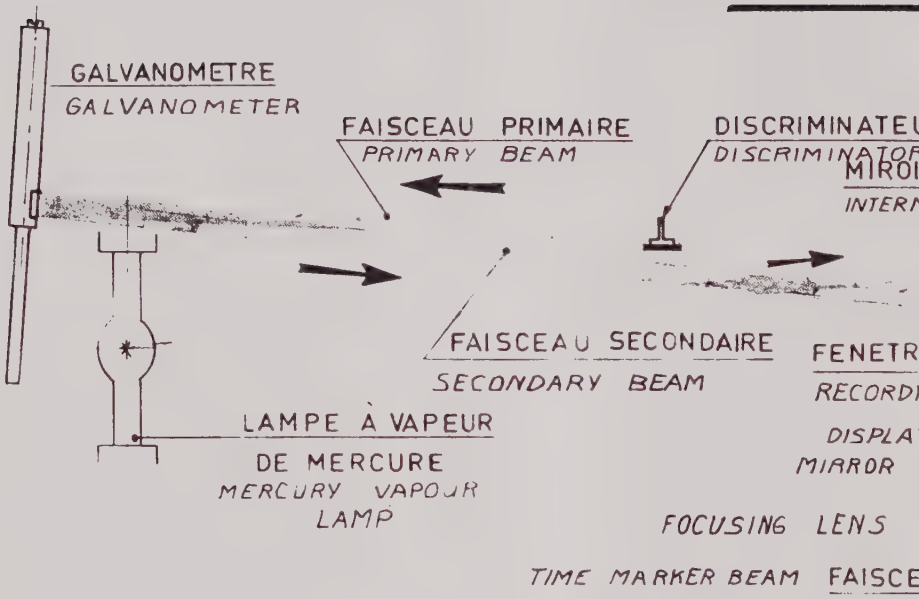
3.3.3 Amplifier Power Supply Type OM4508/0

This power supply sub-unit is detachable and is fitted in a compartment at the rear of the recorder (Figure 3).

It is supplied with the 24V d.c. for the recorder ancillary units and this voltage is regulated and then chopped in order to supply the transformers for the amplifiers used. The voltage is rectified and then smoothed.

Each amplifier is supplied with +15V and -15V voltages which are isolated form the 24V supply.

The power supply sub-unit also provides the reference voltages needed for calibrating the amplifiers. These reference voltages (10mV, 100mV and 1000mV) are stabilized by a zener diode.


GALVANOMETRE
GALVANOMETER
FAISCEAU PRIMAIRE
PRIMARY BEAM
DISCRIMINATEUR
DISCRIMINATOR
MIROIR DE RE
INTERMEDIATE M
FAISCEAU SECONDAIRE
SECONDARY BEAM
FENETRE D' INSC
RECORDING WIN
LAMPE À VAPEUR
DE MERCURE
MERCURY VAPOUR
LAMP
DISPLAY MIROI
MIRROR VISUALI
FOCUSING LENS LENTILLE
TIME MARKER BEAM FAISCEAU DE

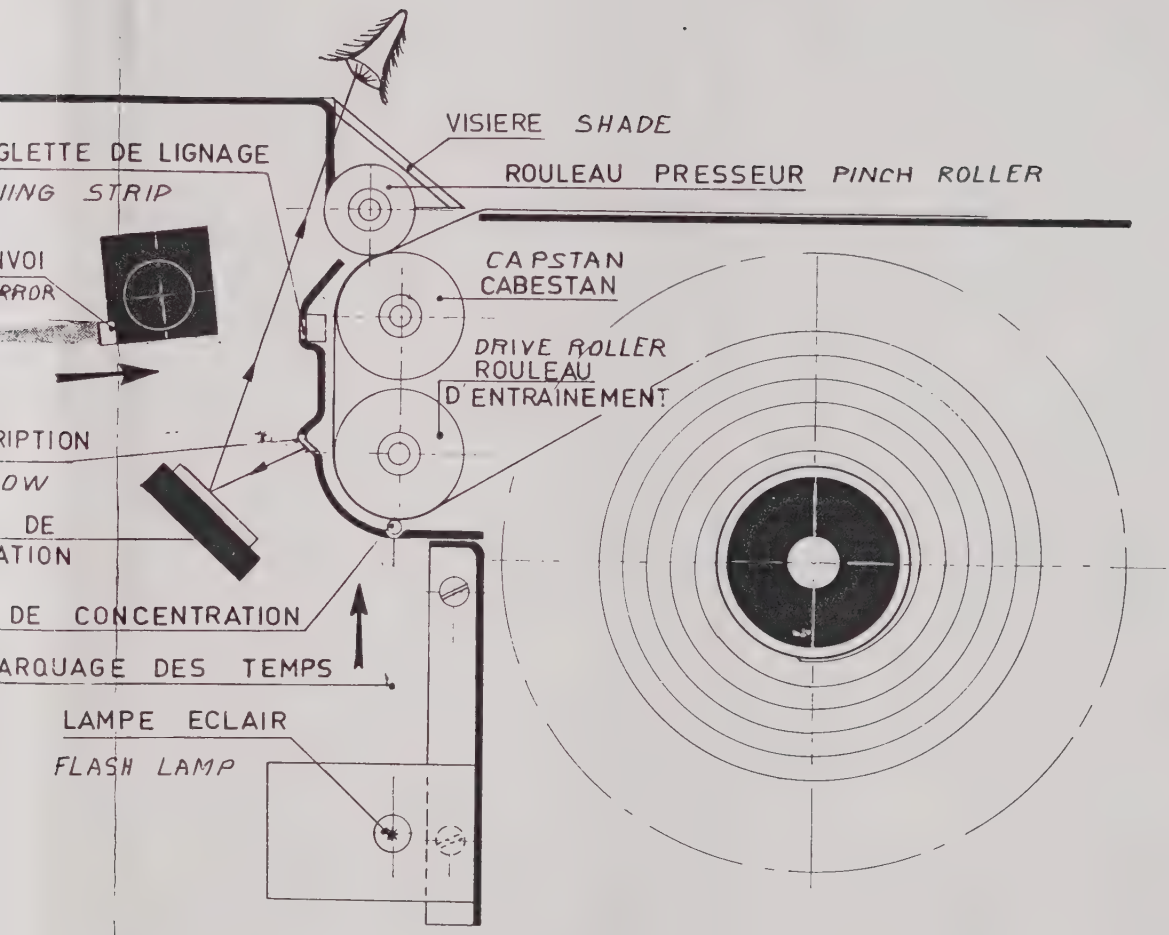



**Fig.9**

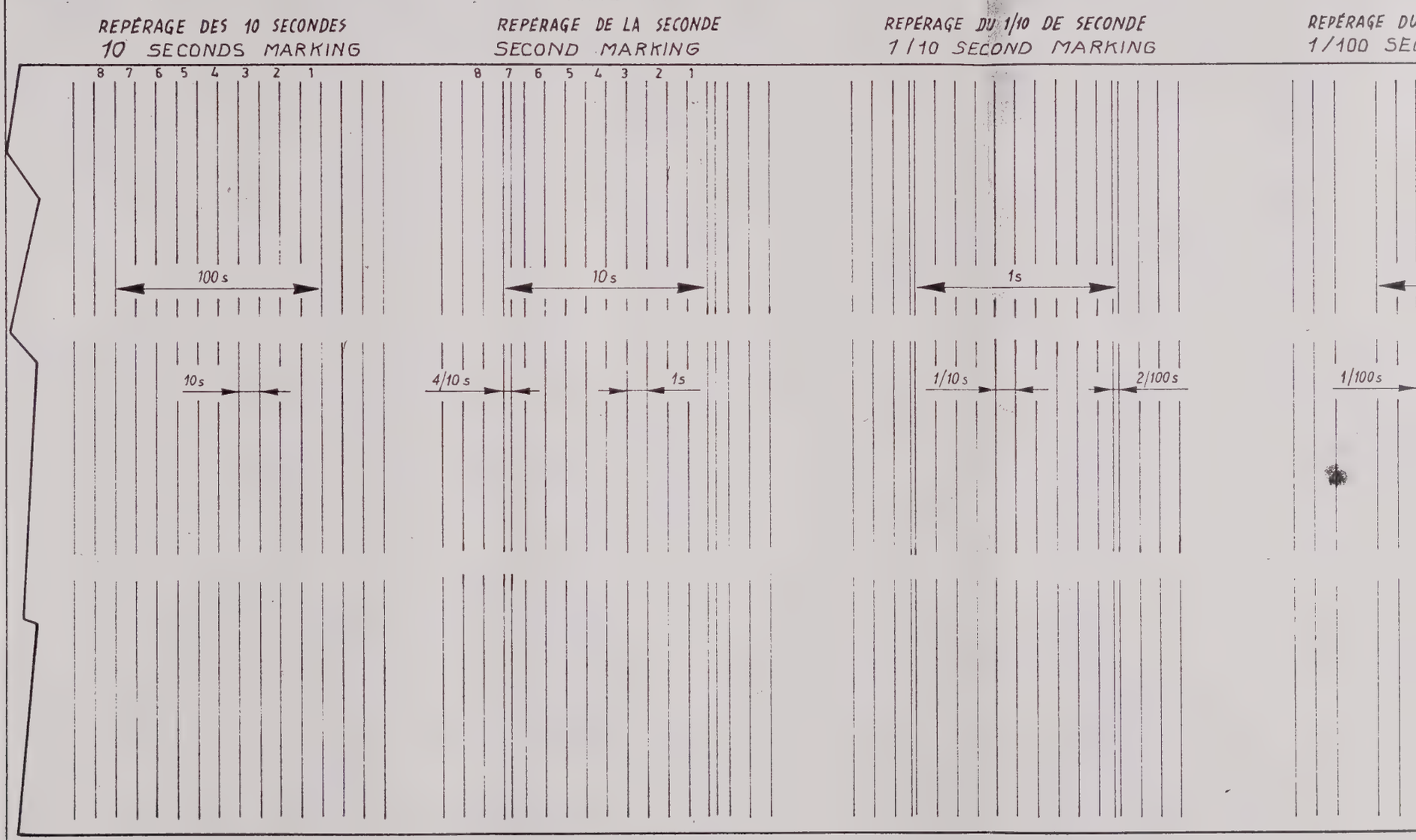
**SCHEMA DE DEFILEMENT DU PAPIER**

**ET CIRCUIT OPTIQUE**

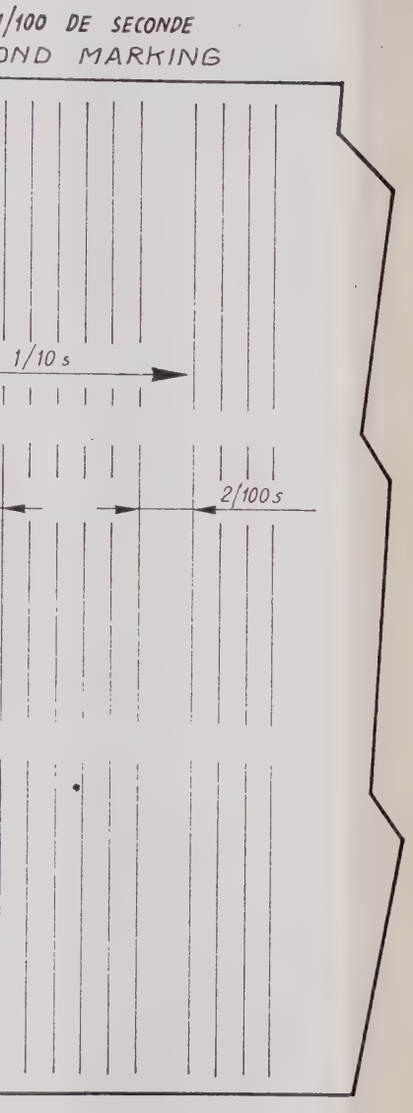
PAPER TRANSPORT AND OPTICAL SYSTEM DIAGRAM

# Identification du marquage de temps

## TIME MARKING IDENTIFICATION




SENS DE DÉFILEMENT DE LA BANDE
DIRECTION OF PAPER TRAVEL



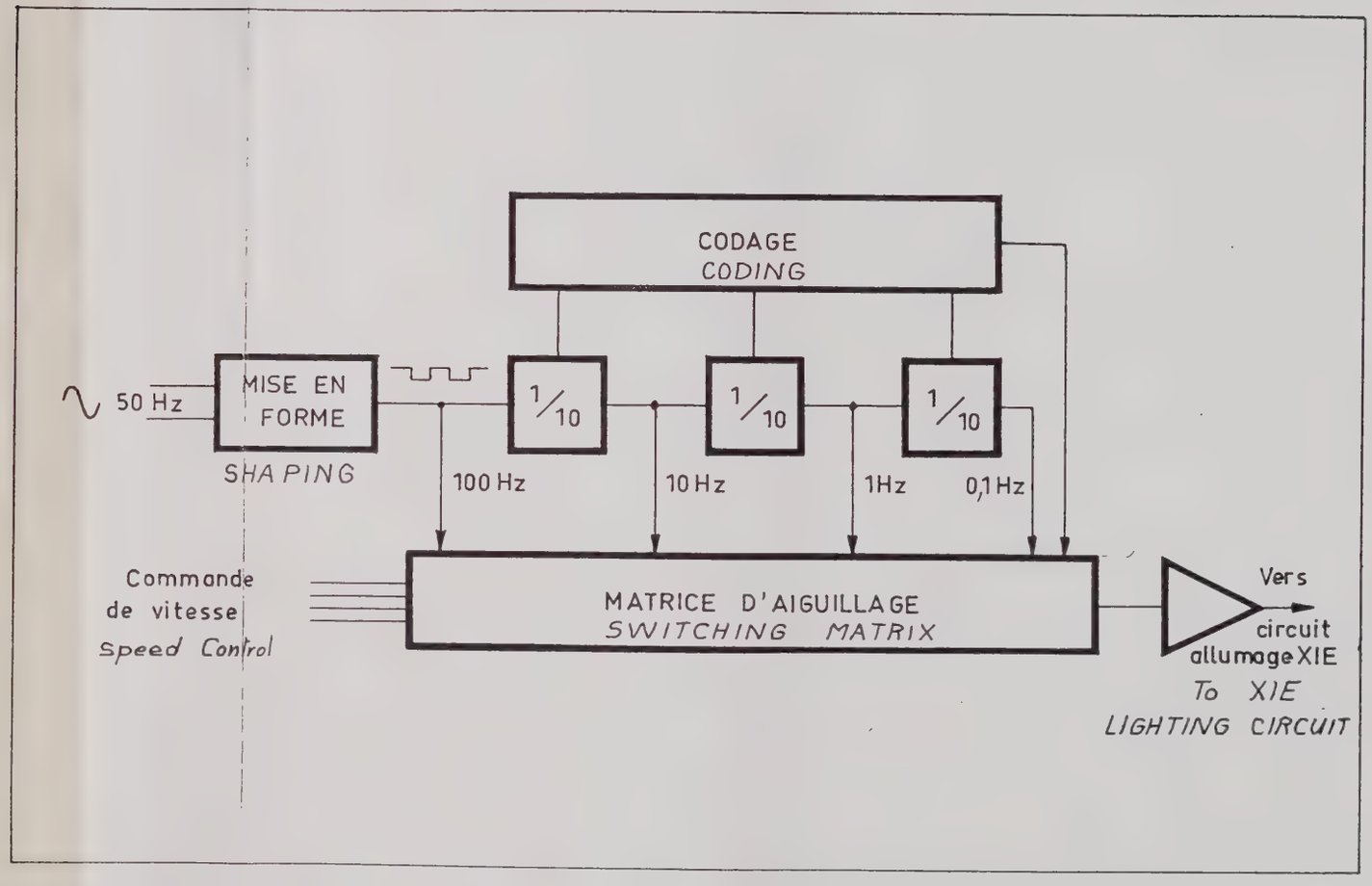




**Fig. 10**

**SCHEMA SYNOPTIQUE DE LA BASE DE TEMPS**
TIMEBASE BLOCK DIAGRAM

# OPERATION

# 4.SETTING UP AND OPERATION

## 4.1 Setting Up

The following items must be fitted before switching on the recorder :

(a) Galvanometers

(b) Amplifiers

(c) Paper

### 4.1.1. Fitting the Galvanometers

Hold the galvanometer by the coded end (coloured spot or ring, large diameter end, screwdriver slot)and insert the other end at an angle of approximately 45° in the magnetic sub-unit housing (Figure 5).
The mirror is positioned on the opposite side from the contact pins. Straighten the galvanometer, then insert it in the bottom of the housing. Avoid any undue sideways force .

### 4.1.2. Fitting the passive matching units

The passive matching units are to be pluged at the rear, in the direct imput sockets. Position them so that adjusting P and S is of an easy access.

### 4.1.3 Fitting the Amplifiers

The amplifiers locate in the compartment provided at the back of the recorder. They are plugged into a power supply sub-unit with miniature banana sockets. Position the amplifier so that the parameter cable can be connected to the input connector. Set the 2-position switch (Figure3, Ref 12) on the power supply sub-unit to the position marked "ZERO GALVA".

After checking the value of the fuse F1, switch on the recorder.

F1 : 1 A mains fuse

The mercury vapour lamp is illuminated and reaches its steady state after about a minute.

Load the paper during this time.

### 4.1.4 Loading the Paper (Figure 6)

(a) Open the door giving access to the paper compartment (Figure 1 Ref 13).

(b) After inserting the shaft in a roll of sensitive paper, replace it in its housing such that the senstive side of the paper is presented to UV rays in the normal direction of travel (Figure 9).

(c) Offer up the paper under the drive roller after folding back both corners at the end of the paper.

(d) Press the loading button (Figure 1, Ref 8) with the right hand. Guide the paper with the thumb and third finger of the left hand. Push the paper in with the index finger of the left hand.

(e) Release the loading button as soon as the paper is taken up.

(f) Check that both ends of the extraction plate (Figure 4, Ref 6) are correctly fitted in their housing.

(g) Close the flap of the paper compartment.

## 4.2 Setting Up the "Optical" Section

These settings must be carried out systematically each time the machine is moved.

### 4.2.1 Setting Up the Mercury Vapour Lamp

After the mercury vapour lamp has reached its steady state, turn the height adjustment screw (Figure 5, Ref 1) until the light beam appears at the focusing lenses for the galvanometers.

In order to do this, place a slip of paper in front of these lenses and rest the end of it on the magnetic sub-unit. The beam must illuminate the bottom of the strip.

If the light beam is already there, unscrew the adjustment screw to make the beam disappear towards the bottom and repeat the adjustment in the opposite direction. Stop screwing as soon as the whole beam appears at its brightest.

NOTE: (1) If the mains supply is accidentally interrupted, the mercury vapour lamp is illuminated again very quickly, provided that the interruption does not last more than 2/10 second. If the interruption lasts longer than 2/10 second, the lamp is only illuminated again after a period of 1 minute.

(2) The light beam must not be set too high otherwise this results in stray light which could cloud the paper.

### 4.2.2 Setting Up the Galvanometers

(a) Position the galvanometers so that the centre line of their mirrors passes through the centre of the paper.

(b) Turn the elevation adjustment screw (Figure 5, Ref 2) to bring the spots into the recording window.

(c) Readjust the spot width settings by positioning the galvanometers in order to locate the spots at the required point on the paper. The thicker lines are identified by engraved marks.

(d) Adjust the elevation adjustment screws to bring the spots to the lower visible edge of the recording window in order to complete the isochronism of the spots.

(e) Repeat any adjustments if necessary.

## 4.3 Setting Up the Ancillaries

### 4.3.1 Setting Up the Zero of the Amplifiers

(1) Set the 2-position switch on the amplifier power supply sub-unit to the position marked "ZERO GALVA".

(2) Identify the spot for the channel used, e.g. by masking the lens of the galvanometer with a bit of paper.

(3) Set the amplifier gain to minimum (gain switch at the "X1" position and the potentiometer set fully counter-clockwise).

(4) Ensure that the signal source is connected and that the amplitude of the quantity to be measured is zero in order to obtain the correct input impedance.

(5) Set the 2-position switch on the power supply sub-unit to the operating position (towards the recorder).

(6) Adjust the potentiometer marked "ZERO" on top of the amplifier (Figure 3, Ref 11) so that the spot does not move when the gain switch marked X1-X10 (Figure 3, Ref 14) is changed from one position to the other.

(7) Set the gain to maximum by means of the amplifier gain potentiometer (Figure 3, Ref 15) and complete the setting up.

NOTE: One of the spigots of the discriminator may mask the spot of the channel in question. In this case, move it by starting the motor for a few moments at the speed of 100m/s for example, or press the loading push-button.

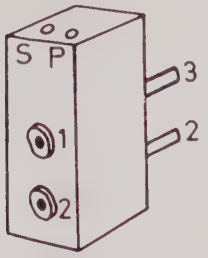
## 4.3.2 Calibrating the Amplifiers

### 4.3.3.1 Matching Unit Type OM4510/1

This matching unit is used with the galvanometers with fundamental frequencies of 100Hz and 200Hz.

Both settings affect one other.

(1) Set the resistance connected between terminals 3 and 4 (see figure below) to 120 ±5 ohms, by adjusting the "P" control.




(2) Set up the sensitivity using the potentiometer "S"

| Average Sensitivity | 100Hz | 200Hz |
|---|---|---|
| Minimum | 200mV/cm | 560 mV/cm |
| Maximum | 12.8mV/cm | 40 mV/cm |

If the internal resistance of the measurement source is less than 1500 ohms, the damping potentiometer "P" must be readjusted to obtain the correct frequency response.

This setting can be achieved with a square wave generator, set to the 10Hz frequency and with the internal resistance equal to that of the measurement source. The best form of trace is then obtained on the recording paper.

### 4.3.3.2 Matching Unit Type OM4510/2

This matching unit is used with galvanometers with fundamental frequencies of 1000Hz and 1800Hz.

Adjust the potentiometer S until the required sensitivity is obtained.

| | 1000Hz | 1800Hz |
|---|---|---|
| Average sensitivity Minimum | 8.7V/cm | 35V/cm |
| Average sensitivity Maximum | 0.61V/cm | 2.4V/cm |
| Maximum current | 1.4mA | 1.4mA |
| Maximum elongation | 8.5cm | 2cm |

NOTE: The power consumption of the galvanometer with the fundamental frequency of 1800Hz limits the power of the matching unit type OM4510/2 to 1W and, because of this, reduces the maximum elongation to 2cm.

4.3.3.3 Matching Unit Type OM4510/0

This matching unit is supplied unfitted. It comprises a casing which encloses the printed circuit and mounts the input and output terminals.

4.4 Identification of Input Connections

(1) A positive signal applied to the upper terminal deflects the spot in the positive direction (to the left).

(2) The connection of the input connector for the amplifiers is shown in the drawing for the amplifiers (a positive signal on 1(white wire) makes the spot deviate on the left).

4.5 Earth Points Available

The different channels, with or without amplifiers, are isolated from each other. The following earth points are available.

4.5.1 Main Earth of the Recorder

Frame earth connected to the black terminals of the 24V supply and to the red terminal of the reference supplies.

4.5.2 Screening (amplifier guard)

Braid of the input cables; the screening is covered with an epoxy paint which protects the users when the quantity to be measured contains a high common mode voltage. Therefore, this layer of paint must not be destroyed.

NOTE: This safety measure is cancelled when the amplifier guard is connected to the recorder earth.

4.6 Analysis of the Recording (See Figure

4.7 Conserving the Traces

Post-illumination of the paper is ensured by the ambient light. The best results are obtained with natural or diffused artificial light. The traces remain for 48 hours in ambient light. The recording may be kept away from the ambient light (drawers, files). Recordings deemed worthwhile can be kept continuously in daylight after processing with the KODAK MX 517-1 developer followed by conventional fixing with hypo.

The chemical processing can be done just as well in darkness as in a properly lighted room, without changing the quality of the recording.

Processing applied to an emulsion which has not undergone post-illumination gives much better contrast. Paper which has undergone photolysis can also be kept in the ambient light, inside orange-yellow transparent covers.

4.8 Fitting the Optional Items

(a) Timebase

(b) Amplifier power supply sub-unit.

4.8.1 Fitting the Timebase

4.8.1.1 Fitting the Board

After removing the spool of paper and closing the various flaps:

(1) Remove the top panel

(2) Unscrew the six Allen screws on the right-hand plate of the gearbox using a 2.5mm Allen key.

(3) Plug in the board

(4) Refit the screws and the top panel.

4.8.1.2 Fitting the Flash Lamp

Turn the recorder upside down:

(1) Remove the fixing screws (Figure 8, Ref 9) from the light board (Figure 8, Ref 10) and fold it backwards. Fit the flash lamp mounting board (Figure 8, Ref 7) and secure it with the spacers, screws and washers supplied with the timebase.

(2) Fit the protective cover (Figure 8, Ref 4) and refit the light board.

(3) Carefully insert the flash lamp in the retaining clips.

(4) Connect the 3 connecting wires while taking care that these wires do not obstruct the light holes.

The wire from the striking electrode (in the middle of 7) must be connected to the middle terminal. The other two wires can be connected either way round.

4.8.2 Fitting the Amplifier Power Supply Sub-unit

With the bottom cover removed after turning the recorder upside down, fit the power supply sub-unit and secure it with the screws supplied. These screws must be fitted through the top of the recorder. Fit the connector (Figure 8, Ref 12) and refit the bottom cover.

4.8.3 Fitting the Discriminator

The discriminator can only be fitted in the factory. The only operation that the user can do is to remove the drive from the discriminator.

(1) After unscrewing the screws (Figure 1, Ref 16), remove the top panel (Figure 1, Ref 15) which mounts the display window.

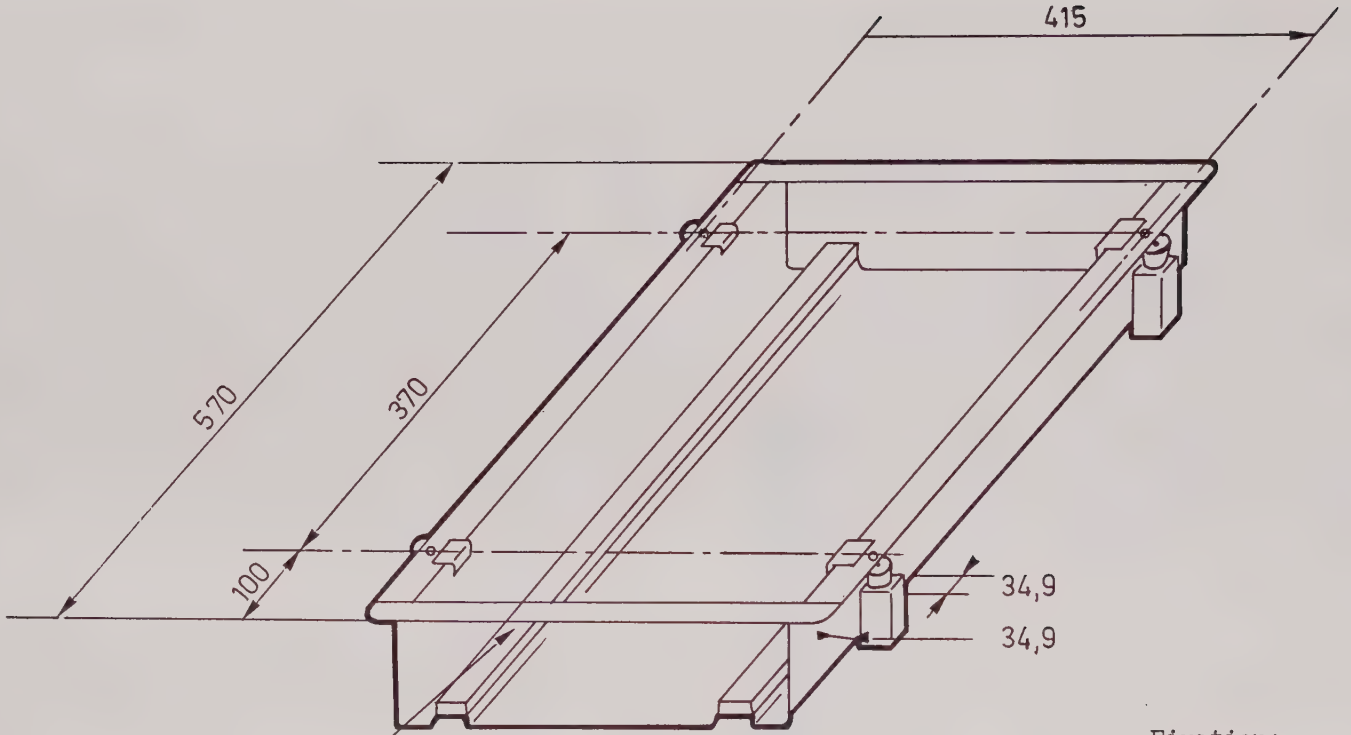
(2) Using a 1.5mm Allen key, loosen the screw securing the capstan pinion (Figure 2, Ref 19). Separate this pinion from the other pinions. Retighten the screw securing the capstan pinion.

(3) Switch on the recorder and position the shadow of one of the discriminator spigots between the magnetic sub-unit and the electromagnetic markers. Locate this shadow with a piece of white paper for example.

(4) Refit the top panel.

SUSPENTION CRADLE OM4512/0 FOR DATA RECORDER OM 4501

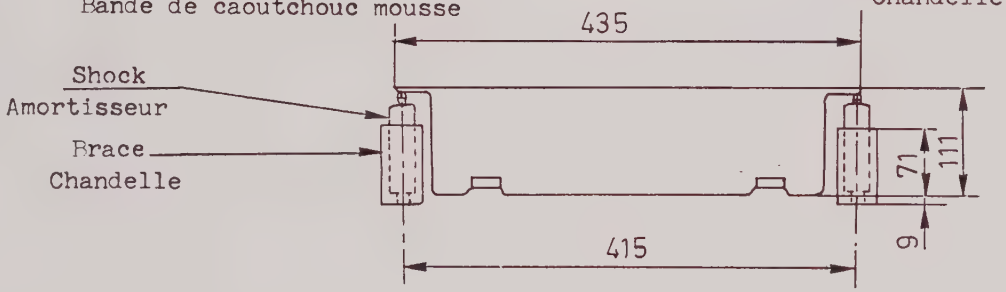
BERCEAU SUSPENDU OM4512/0 POUR ENREGISTREUR OM 4501




Fixation:

Amortisseur. Shock 4 TL Ø 4,2 on ⌀ 34,9

Chandelle. Brace 4 TL Ø 8,5 x 10



# MAINTENANCE

## 5. MAINTENANCE

Maintenance of the portable UV recorder is restricted to the following operations:

(a) Cleaning the recorder

(b) Lubricating the gearbox

(c) Renewing the lamps

### 5.1 Cleaning the Recorder

Depending on the operating conditions, the recorder must be cleaned every 100 or 1000 hours. The cleaning essential when the brilliance of the spots decreases.

Carry out the following procedure:

(a) Remove the top panel (Figure 1, Ref 15). Remove the spool of paper. Turn the recorder upside down and remove the bottom cover.

(b) Place the recorder on its side.

(c) Clean the inside of the recorder using an air pump.

The various optical parts, intermediate mirror, galvanometer lenses and lining strips, will be cleaned with a fine-haired brush or with a bit of cotton rag (take great care not to press on the reflecting surfaces).

### 5.2 Lubricating the Gearbox

In general, after 100 hours continuous operation or after 200 hours intermittent operation, put a drop of SAE 20 type oil on each of the clutch springs.

### 5.3 Renewing the Lamps

#### 5.3.1 Renewing the UV Lamp

The average life of the UV lamp is about 200 hours under normal operating conditions: minimum of 2 hours operation after each lighting.

This operating life is decreased by half if the average operating time after each lighting is 20 minutes.

Avoid successive switch-ons of less than 15 minutes.

Carry out the following procedure to renew the lamp:

(a) Wait until the recorder has cooled down.

(b) Open the access flap (Figure 1, Ref 17) to the UV lamp.

(c) Fully unscrew the height adjustment screw for the lamp (Figure 5, Ref 1).

(d) Withdraw the UV lamp bracket (Figure 7, Ref 3) from its housing (Ref 2).

(e) Press the ejection push-button (Figure 7, Ref 4).

(f) Bring out the lamp via the hole (Ref 5) by means of the lower socket (Ref 6).

(g) Remove the lamp from the socket and fit a new lamp.

(h) Reassemble the different items in the reverse order from that detailed above.

IMPORTANT: During the above procedure, the fingers must not be allowed to come into contact with the bulb of the lamp, otherwise they would mark it. Should this happen accidentally, the deposit must be removed by cleaning the bulb with "95°" alcohol. If this is not done, the light image would be spoiled.

After refitting the lamp bracket,

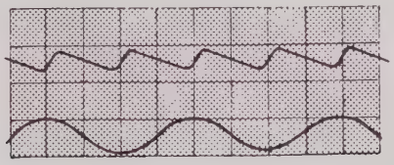
(j) Screw in the height adjustment screw about ten revolutions.

(k) Readjust the height of the lamp in accordance with the details given in para 4.2.1.

5.3.2 Renewing the Flash Lamp

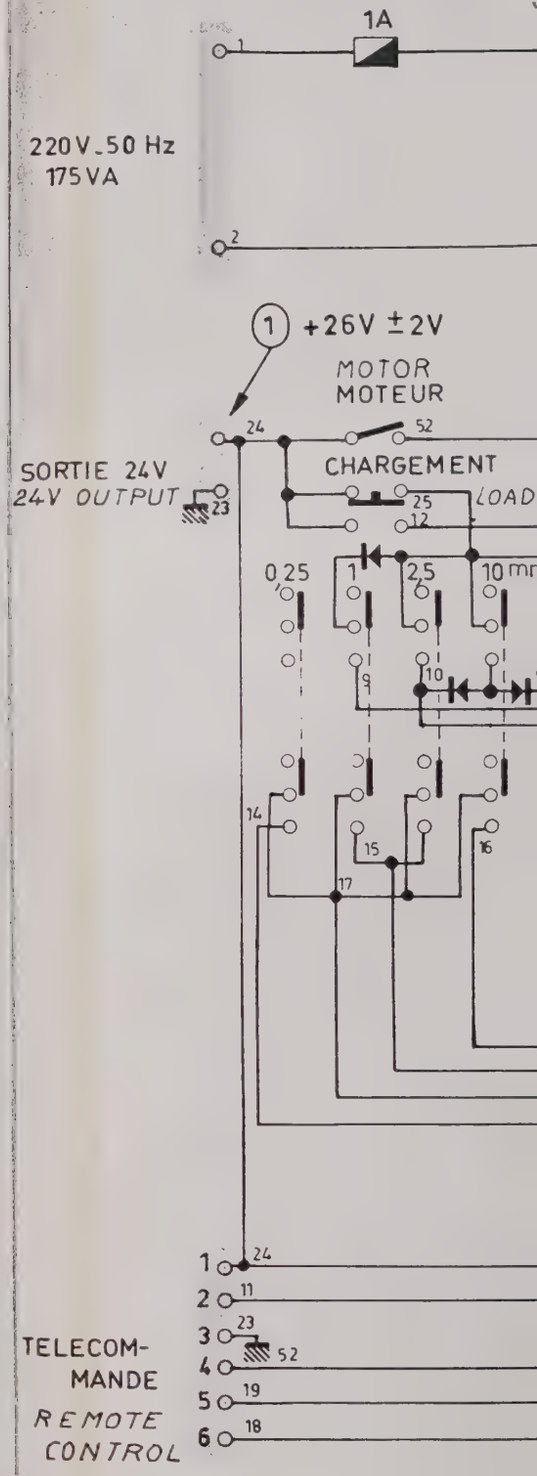
The operating life of a flash lamp is approximately 20 000 000 flashes. Carry out the procedure detailed in para 4.8.1.2.

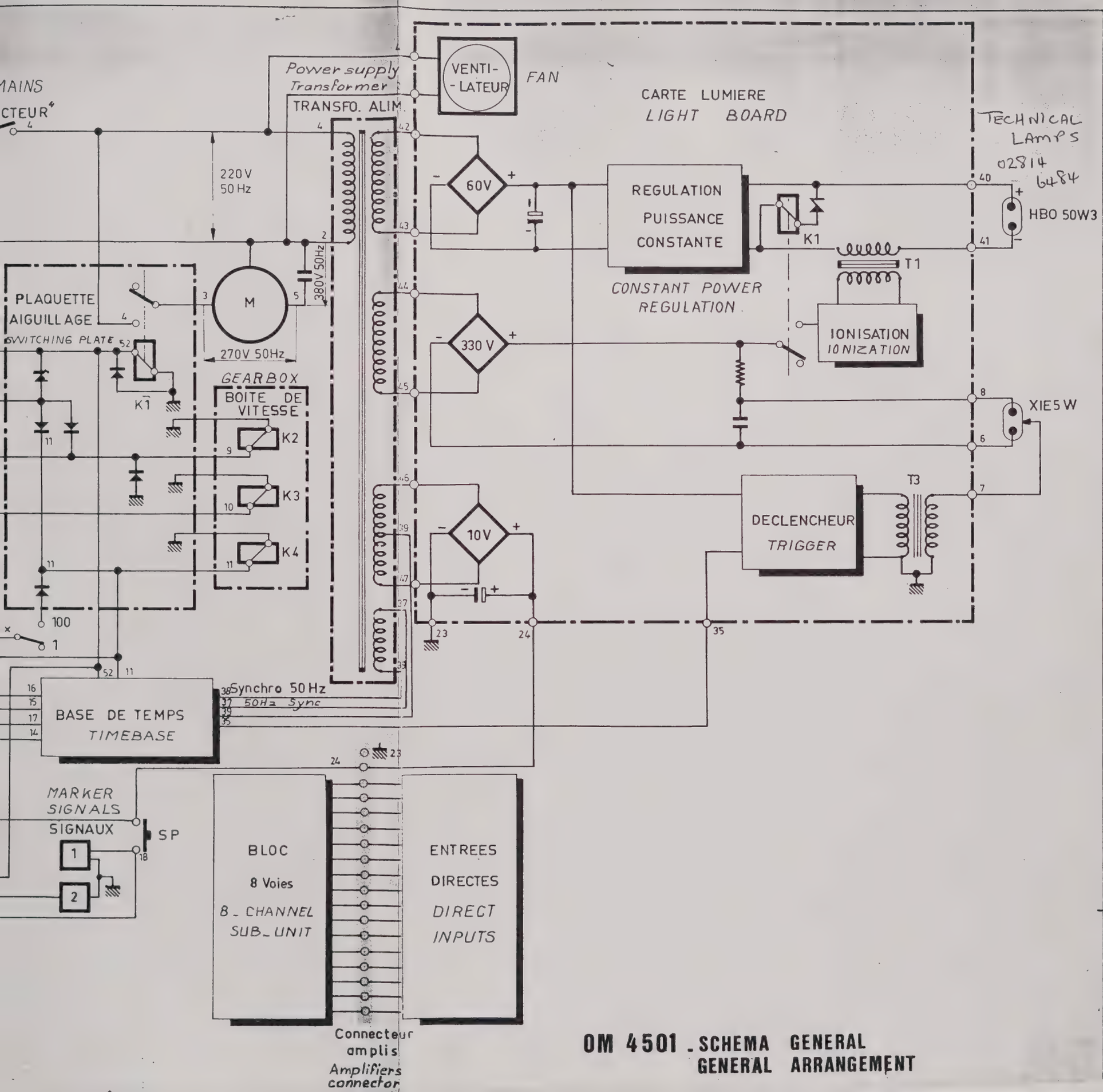
1V/cm Résiduelle (1)



Secteur
220V~ 50Hz

5ms/cm






**OM 4501 - SCHEMA GENERAL**
**GENERAL ARRANGEMENT**

PARTS LIST FOR THE LIGHT BOARD OM4501

CAPACITORS

| | | | | |
|---|---|---|---|---|
| C1 | Electrolytic | 820µF | | |
| C2 | Electrolytic | 2200µF | 40/48V | |
| C3 | Electrolytic | 320µF | 63/76V | |
| C4 | Mylar | 1µF | 630V | 20% |
| C5 | Mylar | 0.47µF | 630V | 20% |
| C6 | Mylar | 0.47µF | 160V | 20% |
| C7 | Mylar | 0.47µF | 160V | 20% |
| C8 or | " | 0.047µF | 160V | 20% |
| C8 | Polyester | 0.047µF | 250V | 20% |

DIODES

| | |
|---|---|
| CR1 | Bridge rectifier type ~~MOP~~ MCP.2 |
| CR2 | Bridge rectifier type ~~MOP~~ MCP.2 |
| CR3 | Bridge rectifier type W.06 |
| CR4 | Zener, type ZF 8.2 ITT |
| CR5 | IN4148 |
| CR6 | IN646 |
| CR7 | Controlled avalanche IN3942 |
| CR8 | Controlled avalanche IN3942 |
| CR9 | Controlled avalanche IN3942 |
| CR10 | Controlled avalanche IN3942 |
| CR11 | Zener, type ZF24 |
| CR12 | IN4148 |
| CR13 | (High speed) IN3880R |
| CR14 | IN4148 |

RELAY

| | |
|---|---|
| K1 | Relay type MS13 (1100Ω, 24V, single changeover contact) |

RESISTORS

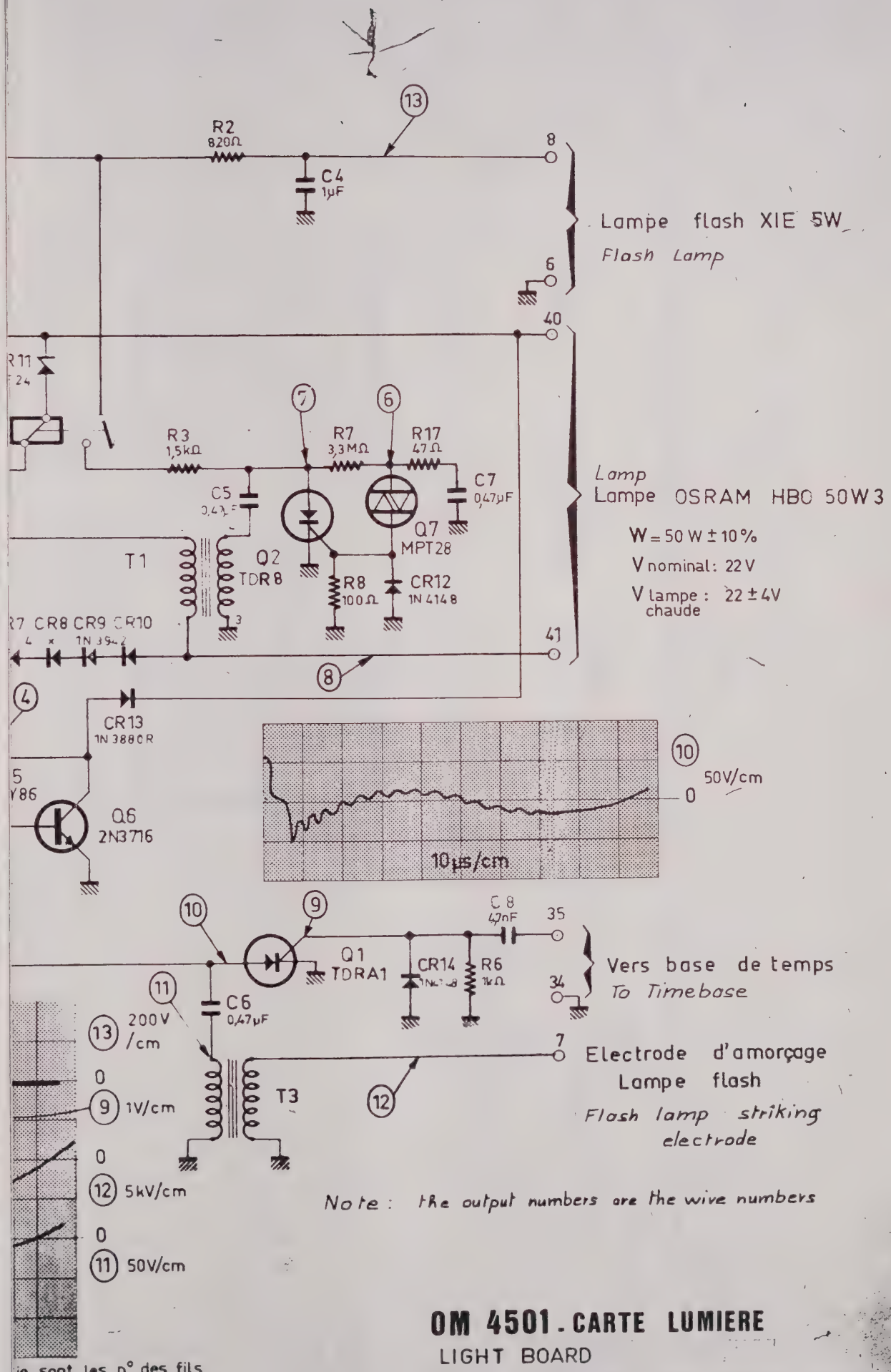
| | | | | |
|---|---|---|---|---|
| R1 | 0.25Ω | 1% | 6W | 10p.p.m. type T6 RCL |
| R2 | 820Ω | 5% | 7W | type RB 57V Sfernice |
| R3 | 1.5kΩ | 5% | 3W | type RB 59V Sfernice |
| R4 | 1.5kΩ | 5% | 3W | type RB 59V Sfernice |
| R5 | 4.7kΩ | 5% | 1W | LCA0719 Categ, 2, Rosenthal |
| R6 | 1kΩ | | ¼W | S0103 |
| R7 | 3.3MΩ | | ¼W | S0103 |
| R8 | 100Ω | | ¼W | S0103 |
| R9 | 1kΩ | | ¼W | S0103 |
| R10 | 1kΩ | | ¼W | S0103 |
| R11 | 4.7kΩ | | ¼W | S0103 |
| R12 | 1.21kΩ | 1% | ¼W | S0112 |
| R13 | 357Ω | 1% | ¼W | S0112 |
| R14 | 562Ω | 1% | ¼W | S0112 |
| R15 | 10kΩ | 1% | ¼W | S0112 |
| R16 | Potentiometer, 200Ω type R9 Eurohm | | | |
| or | Potentiometer, 220Ω type AB12-MCB | | | |
| R17 | 47Ω | 5% | ¼W | |

TRANSISTORS

| | | | |
|---|---|---|---|
| Q1 | Thyristor | TDRA1 | Silec |
| Q2 | Thyristor | TDR8 | Silec |
| Q3 | Transistor | 2N4036 | RCA |
| Q4 | Transistor | 2N2219 | |
| Q5 | Transistor | BSY86 | ITT |
| Q6 | Transistor | 2N3716 | Motorola |
| Q7 | Silicon controlled rectifier | | MPT28 |

TRANSFORMERS

| | |
|---|---|
| T1 | SIS type P18255 |
| T2 | SIS type P18256 |
| T3 | SIS type P18257 |




*Note : the output numbers are the wive numbers*

ie sont les n° des fils

# OM 4501. CARTE LUMIERE

LIGHT BOARD

## CONDENSATEUR

| | | | |
|---|---|---|---|
| C1 | Condensateur électrochimique | 820 µF | |
| C2 | " | 2200 µF | 40/48V |
| C3 | " | 320 µF | 63/76V |
| C4 | " Mylar | 1 µF | 630 V 20% |
| C5 | " " | 0,47 µF | 60V20% |
| C6 | " " | 0,47 µF | 160V20% |
| C7 | " " | 0,47 µF | 160V20% |
| C8 ou | " " | 0,047 µF | 160V20% |
| C8 | " Polyester | 0,047 µF | 250V 20% |

## DIODES

| | |
|---|---|
| CR1 | Pont redresseur type W.06.2 |
| CR2 | " " " " |
| CR3 | " " " W.06. |
| CR4 | ZENER type ZF 8,2 ITT. |
| CR5 | 1N.4148 |
| CR6 | 1N.646 |
| CR7 | (à avalanche contrôlée) 1N 3942 |
| CR8 | " " " " " |
| CR9 | " " " " " |
| CR10 | " " " " " |
| CR11 | ZENER type ZF.24 |
| CR12 | 1N. 4148 |
| CR13 | (rapide) 1N.3880 R |
| CR14 | 1N.4148 |

## RELAIS

K1 Relais type MS 13 (1100Ω 24V 1RT)

## RESISTANCES

| | | | |
|---|---|---|---|
| R1 | 0,25Ω 1% 6 W | 10 ppm | type T6 RCL |
| R2 | 820Ω 5% 7 W | type | RB 57V Sfernice |
| R3 | 1,5 kΩ 5% 3 W | " | RB 59V Sfernice |
| R4 | 1,5 kΩ " " | " | " " |
| R5 | 4,7 kΩ " 1 W | | LCA 0719 C1.2 Rosenthal |
| R6 | 1 kΩ 1/4 W | | S0 103 |
| R7 | 3,3 MΩ " " | | " " |
| R8 | 100Ω " " | | " " |
| R9 | 1 kΩ " " | | " " |
| R10 | 1 kΩ " " | | " " |
| R11 | 4,7 kΩ " " | | " " |
| R12 | 1,21 kΩ 1% 1/4 W | | " 112 |
| R13 | 357Ω " " | | " 112 |
| R14 | 562Ω " " | | " 112 |
| R15 | 10 kΩ " " | | " 112 |
| R16 | Potentiomètre 200Ω | | type R9 Eurohm |
| ou | " 200Ω | | type AB12- MCB |
| R17 | 47Ω 5 % 1/4W | | |

Mesures par rapport a la masse sauf ⑤

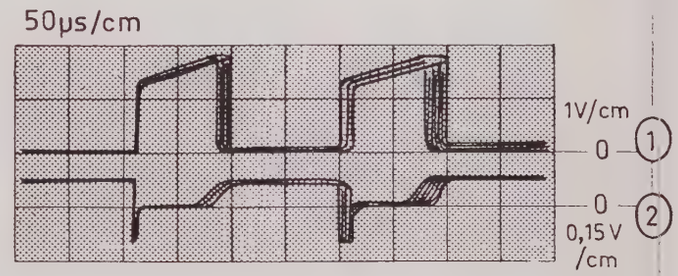
⑥ ⑦ et ⑧ Mesures avec une lampe chaude non amorcée

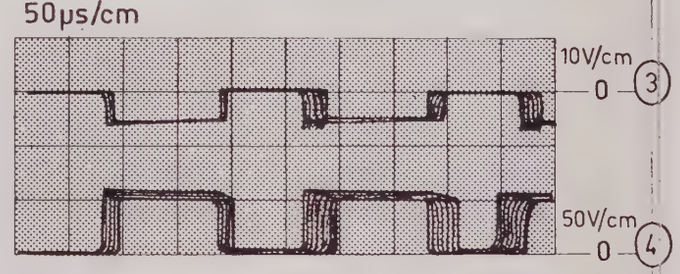
## TRANSISTORS

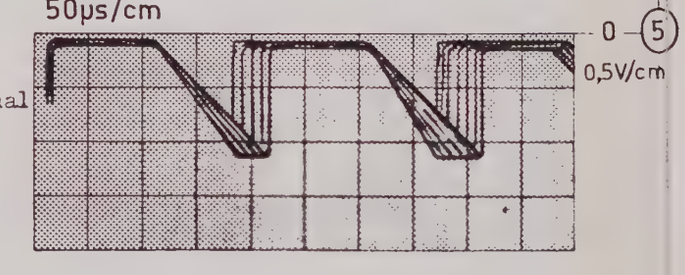
| | | | |
|---|---|---|---|
| Q1 | Thyristor | TDR A1 | Silec |
| Q2 | Thyristor | TDR 8 | Silec |
| Q3 | Transistor | 2N 4036 | RCA |
| Q4 | " | 2N 2219 | |
| Q5 | " | BSY 86 | ITT |
| Q6 | " | 2N 3716 | Motorola |

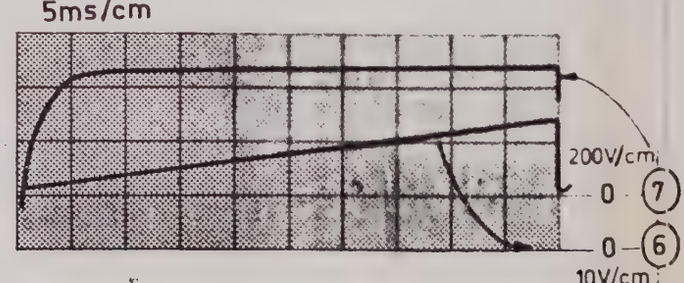
## TRANSFOS

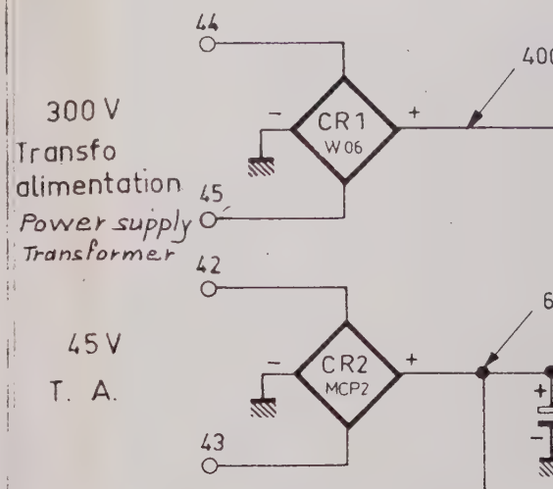
| | | | |
|---|---|---|---|
| T1 | Transfo type | P 18255 | SIS |
| T2 | " " | P 18256 | " |
| T3 | " " | P 18257 | " |

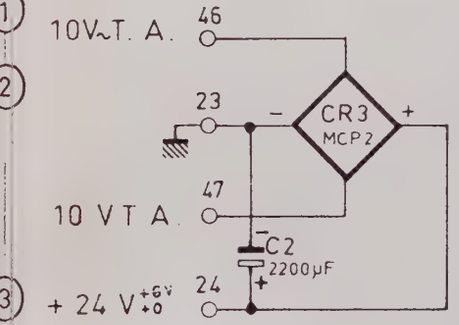


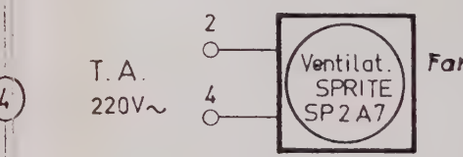



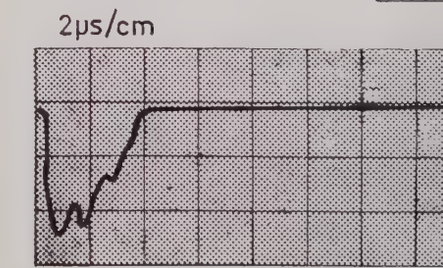



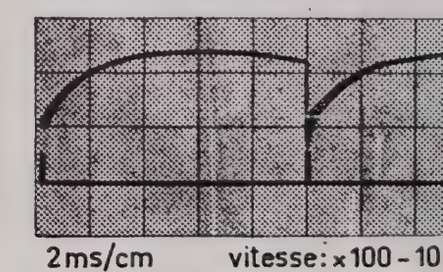



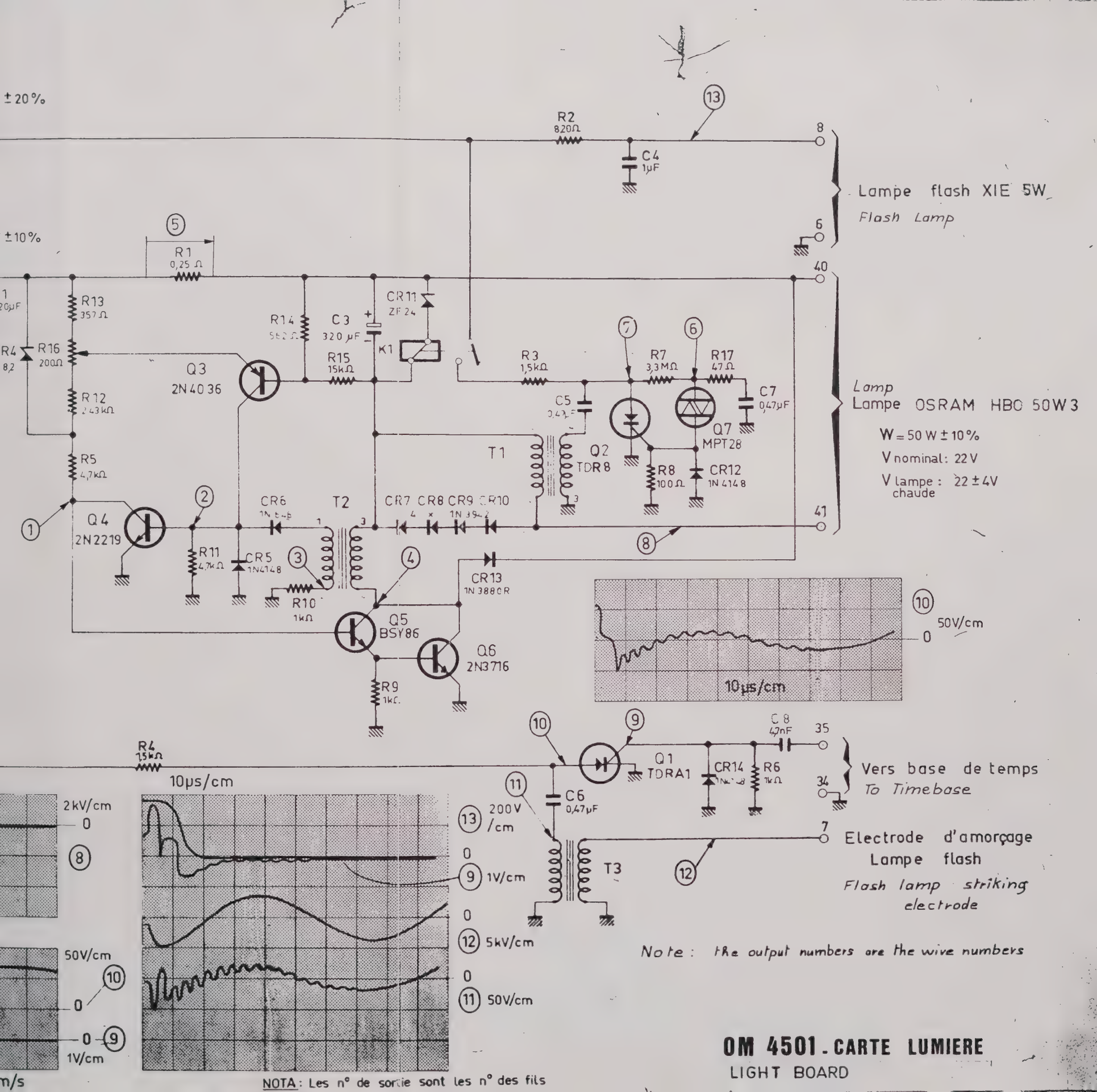






# OM 4501 - CARTE LUMIERE

LIGHT BOARD

## CIRCUITS INTEGRES

| | | | |
|---|---|---|---|
| IC1 | SN 7490N | Texas Instrument | |
| IC2 | SN 7490N | " | " |
| IC3 | SN 7490N | " | " |
| IC4 | SN 7400N | " | " |
| IC5 | SN 7420N | " | " |
| IC6 | SN 7420N | " | " |
| IC7 | SN 7410N | " | " |
| IC8 | SN 7400N | | |

## TRANSISTORS

| | | |
|---|---|---|
| Q1 | 2N956 | Texas Instrument |
| Q2 | BD106A | ITT |

## CONDENSATEURS

| | |
|---|---|
| C1 | polyester 0,47 µF 63V 20% |
| C2 | céramique 10 nF 40 V EZP |
| C3 | tantale 10 µF 16 V GPB1 |
| C4 | tantale 10 µF 16 V GPB1 |
| C5 | chimique 500 µF 25 V |

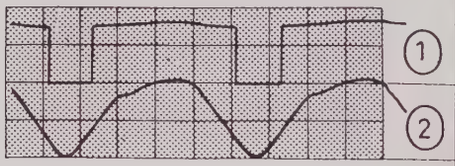
## DIODES

| | |
|---|---|
| CR1 à CR15 | 1N 4148 ou TF51 ou ITT51 |
| CR16 | Zener ZF 5,6 ITT |
| CR17 | Zener 18 Z6 AF Sescosem |

## RESISTANCES

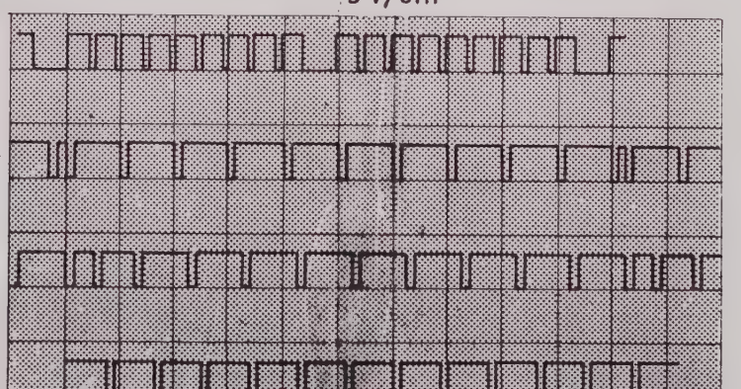
| | | | |
|---|---|---|---|
| R1 | 1/2 W 5% 270Ω | couche | carbone |
| R2 | 1/4 W 5% 820Ω | couche | carbone |
| R3 | 1/4 W 5% 390Ω | " | " |
| R4 | 1/4 W 5% 1,5kΩ | " | " |
| R5 | 1/4 W 5% 390Ω | " | " |
| R6 | 1/4 W5% 6,8Ω | " | " |
| R7 | 1/4 W 5% 220Ω | " | " |
| R8 | 1/2 W 5% 3,3 kΩ | " | " |
| R9 | 1/4 W 5% 3,3 kΩ | " | " |
| R10 | 1/4 W 5% 220Ω | " | " |
| R11 | 1/4 W 5% 3,3 kΩ | " | " |
| R12 | 1/4 W 5% 2,2 kΩ | " | " |
| R13 | 1/4 W 5% 220Ω | " | " |
| R14 | 1/4 W 5% 220Ω | " | " |
| R15 | 1/4 W 5% 390Ω | " | " |
| R16 | 1/4 W 5% 390Ω | " | " |

Mesures par rapport à la masse

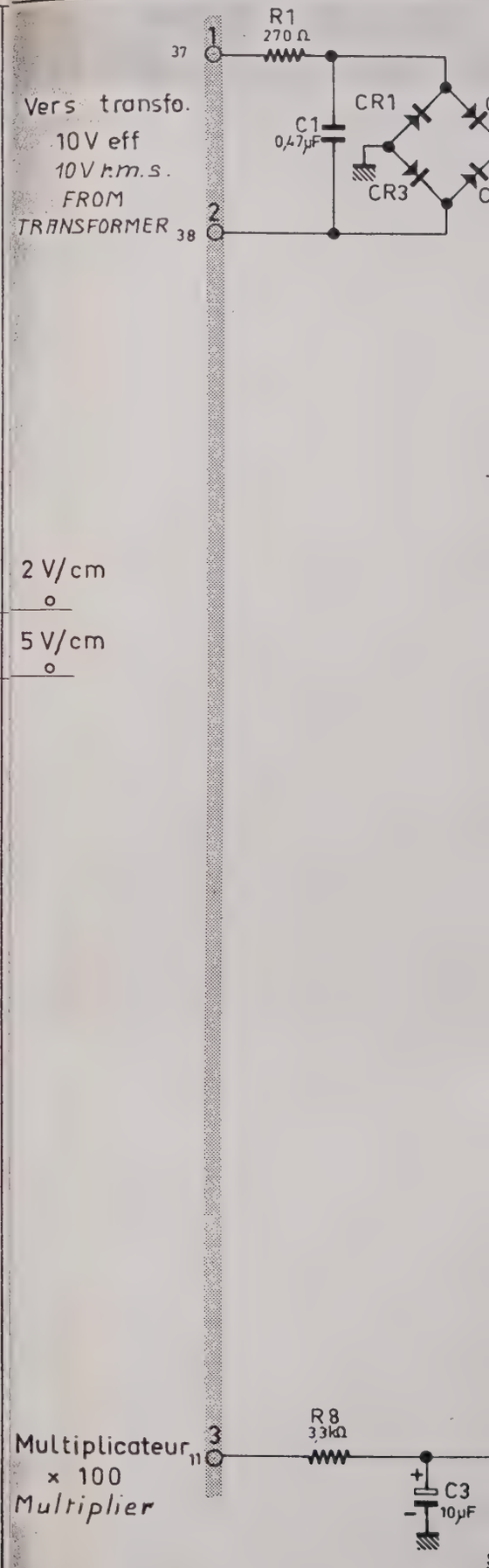


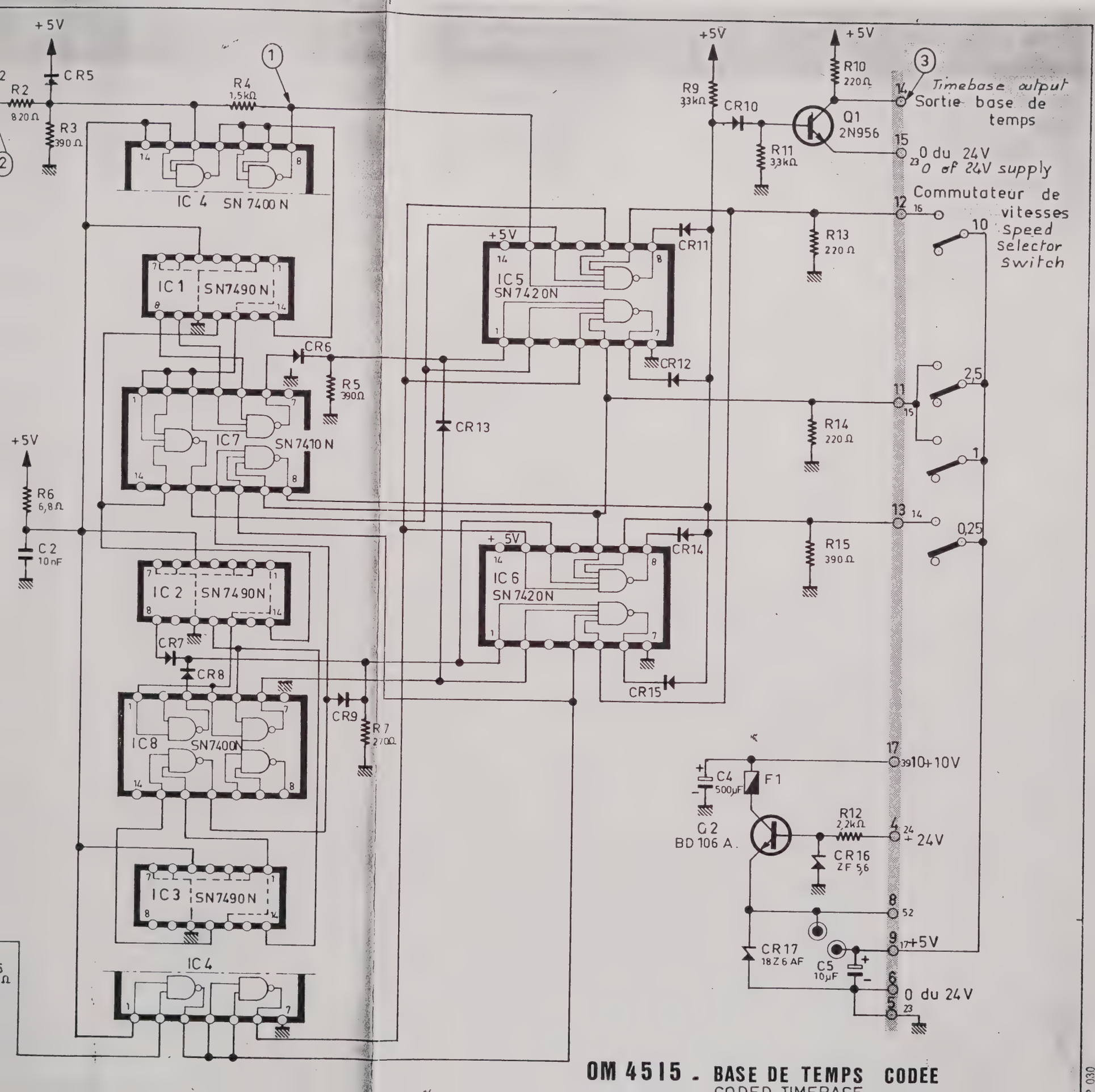

Mesures faites avec mémoscope 549 Tektronix

Vitesse affichée




③






**OM 4515 - BASE DE TEMPS CODEE**
CODED TIMEBASE

## PARTS LIST FOR CODED TIMEBASE OM4515

### INTEGRATED CIRCUITS

| | | |
|---|---|---|
| IC1 | SN7490N | Texas Instruments |
| IC2 | SN7490N | Texas Instruments |
| IC3 | SN7490N | Texas Instruments |
| IC4 | SN7400N | Texas Instruments |
| IC5 | SN7420N | Texas Instruments |
| IC6 | SN7420N | Texas Instruments |
| IC7 | SN7410N | Texas Instruments |
| IC8 | SN7400N | Texas Instruments |

### CAPACITORS

| | | | | |
|---|---|---|---|---|
| C1 | Polyester | 0.47µF | 63V | 20% |
| C2 | Ceramic | 10nF | 40V | EZP |
| C3 | Tantalum | 10µF | 16V | GPB1 |
| C4 | Tantalum | 10µF | 16V | GPB1 |
| C5 | Electrolytic | 500µF | 25V | |

### DIODES

CR1 to CR15 IN4148 or TF51 or ITT51

CR16 zener ZF5.6 ITT

CR17 zener 18 Z6 AF Sescosem

### RESISTORS

| | | | | |
|---|---|---|---|---|
| R1 | 270Ω | 5% | ½W | carbon film |
| R2 | 820Ω | 5% | ¼W | carbon film |
| R3 | 390Ω | 5% | ¼W | carbon film |
| R4 | 1.5kΩ | 5% | ¼W | carbon film |
| R5 | 390Ω | 5% | ¼W | carbon film |
| R6 | 6.8Ω | 5% | ¼W | carbon film |
| R7 | 220Ω | 5% | ¼W | carbon film |
| R8 | 3.3kΩ | 5% | ½W | carbon film |
| R9 | 3.3kΩ | 5% | ¼W | carbon film |
| R10 | 220Ω | 5% | ¼W | carbon film |
| R11 | 3.3kΩ | 5% | ¼W | carbon film |
| R12 | 2.2kΩ | 5% | ¼W | carbon film |
| R13 | 220Ω | 5% | ¼W | carbon film |

RESISTORS - continued

| | | | | |
|---|---|---|---|---|
| R14 | 220Ω | 5% | ¼W | carbon film |
| R15 | 390Ω | 5% | ¼W | carbon film |
| R16 | 390Ω | 5% | ¼W | carbon film |

TRANSISTORS

| | | |
|---|---|---|
| Q1 | 2N956 | Texas Instruments |
| Q2 | BD106A | ITT |

CIRCUIT INTEGRE

IC1 SFC 2301 A

CONDENSATEURS

C1 tantale 10 µF 16V GBP1
C2 " " " "
C3 " " " "
C4 céramique 15 pF 250V 20%

DIODES

CR1 TF 23 TEXAS
CR2 " " "
CR3 ZENER IN 941
CR4 ZENER " "
CR5 à
CR8 ITT 51 ITT

INVERSEUR

I1 subminiature 50 MT profs. Jeanrenaud

RESISTANCES

R1 1/4W 100 kΩ 1%
R2 " 100Ω 5%
R3 " 1,2 kΩ " couche carbone
R4 " 1 kΩ " "
R5 potentiomètre 5 kΩ IRC Type 205_207
R6 1/4W 82Ω 5% couche carbone
R7 " 82Ω " " "
R8 " 10KΩ " " "
R9 Potentiomètre 22 kΩ 5% Heli 19 MCB ou

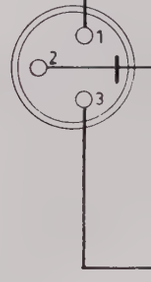
R10 1/4W 182Ω 1% couche métal.
R11 " 10Ω " " "
R12 " 94,3Ω 0,5% AVL GEKA
R13 " 470Ω 5% couche carbone
R14 " 330Ω " " "
R15 " 10 kΩ " " "
R16 " 330Ω " " "

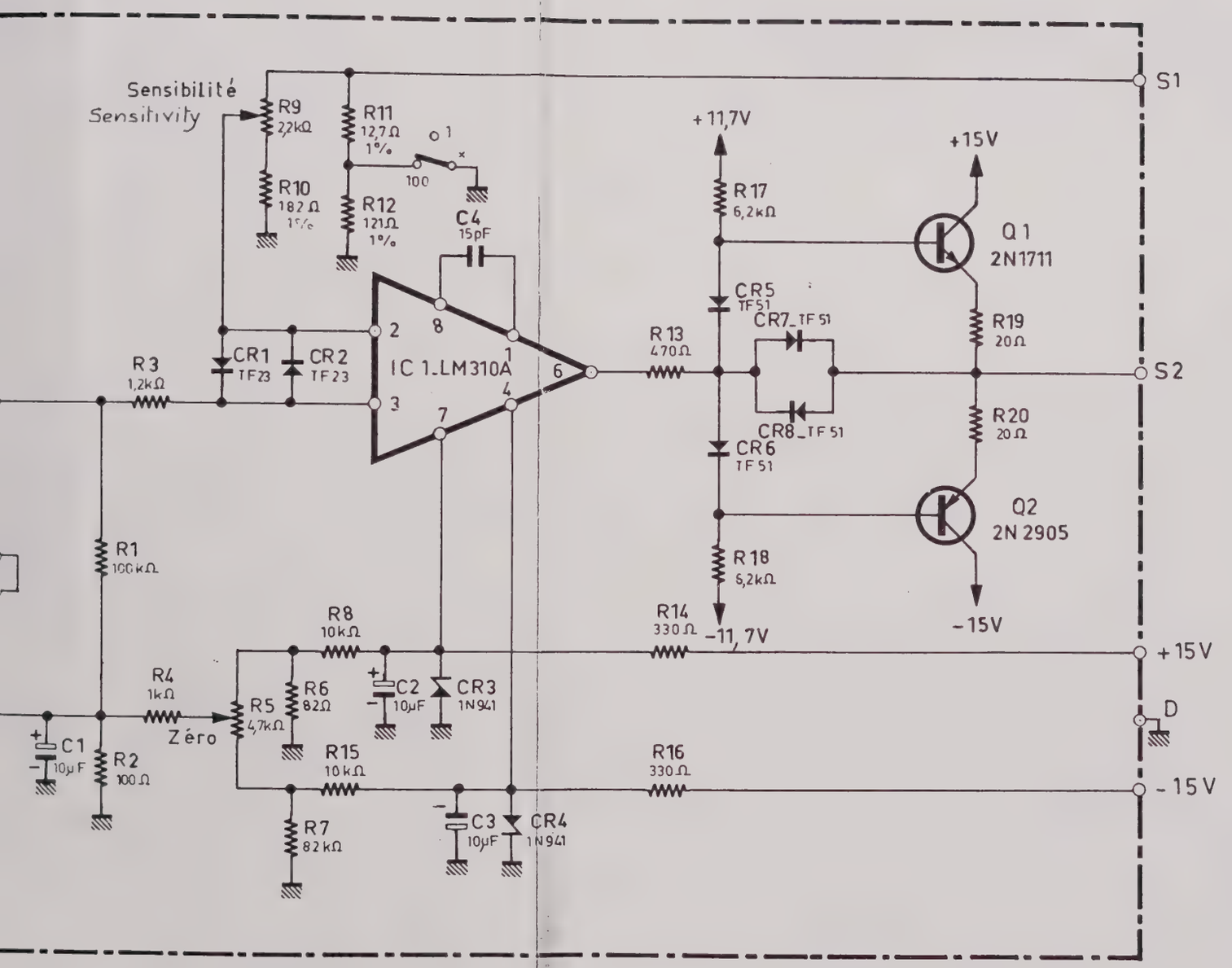
RESISTANCES (suite)

R17 1/4W 6,2 kΩ5% couche carbone
R18 1,4W 6,2 kΩ" " "
R19 " 20Ω " " "
R20 " 20Ω " " "

TRANSISTORS

Q1 2N 1711
Q2 2N 2905






**OM 4509 - AMPLIFICATEUR**

AMPLIFIER

## PARTS LIST FOR AMPLIFIER OM4509

### PRINTED CIRCUIT

IC1 SFC 2301 A

### CAPACITORS

| | | | | |
|---|---|---|---|---|
| C1 | Tantalum | 10µF | 16V | GBP1 |
| C2 | Tantalum | 10µF | 16V | GBP1 |
| C3 | Tantalum | 10µF | 16V | GBP1 |
| C4 | Ceramic | 10µF | 16V | GBP1 |

### DIODES

| | | |
|---|---|---|
| CR1 | TF23 | Texas |
| CR2 | TF23 | Texas |
| CR3 | Zener, | IN941 |
| CR4 | Zener | IN941 |
| CR5 to CR8 | | ITT51 ITT |

### SWITCH

I1 2-position, subminiature 50MT profs. Jeanrenaud

### RESISTORS

| | | | | |
|---|---|---|---|---|
| R1 | 100kΩ | 1% | ¼W | |
| R2 | 100Ω | 5% | ¼W | |
| R3 | 1.2kΩ | 5% | ¼W | carbon film |
| R4 | 1kΩ | 5% | ¼W | carbon film |
| R5 | Potentiometer 5kΩ | IRC type 205-207 | | |
| R6 | 82Ω | 5% | ¼W | carbon film |
| R7 | 82Ω | 5% | ¼W | carbon film |
| R8 | 10kΩ | 5% | ¼W | carbon film |
| R9 | Potentiometer 22kΩ | 5% Heli 19 MCB | | |
| R10 | 182Ω | 1% | ¼W | metal oxide |
| R11 | 10Ω | 1% | ¼W | metal oxide |
| R12 | 94.3Ω | 0.5% | ¼W | AVL GEKA |
| R13 | 470Ω | 5% | ¼W | carbon film |
| R14 | 330Ω | 5% | ¼W | carbon film |
| R15 | 10kΩ | 5% | ¼W | carbon film |
| R16 | 330Ω | 5% | ¼W | carbon film |

RESISTORS - continued

| | | | | |
|---|---|---|---|---|
| R17 | 6.2kΩ | 5% | ¼W | carbon film |
| R18 | 6.2kΩ | 5% | ¼W | carbon film |
| R19 | 20Ω | 5% | ¼W | carbon film |
| R20 | 20Ω | 5% | ¼W | carbon film |

TRANSISTORS

| | |
|---|---|
| Q1 | 2N1711 |
| Q2 | 2N2905 |

PARTS LIST FOR AMPLIFIER POWER SUPPLY OM4508

CAPACITORS

| | | | | |
|---|---|---|---|---|
| C1 | Dry tantalum | 3µF | 40V | GPB |
| C2 | Dry tantalum | 10µF | 16V | GPB1 |
| C3 | Dry tantalum | 10µF | 16V | GPB1 |
| C4 to C21 | Dry tantalum | 10µF | 25V | GPB2 |

DIODES

| | | |
|---|---|---|
| CR1 to CR15 | ITT51 or TF51 | |
| CR16 | Zener | ZF15 |
| CR17 | Zener | IN821 |
| CR18 to CR37 | ITT51 or TF51 | |

SWITCH

| | | |
|---|---|---|
| I1 | Subminiature 50MT profes. | |
| | Button L8 Jeanrenaud | |

RESISTORS

| | | | | |
|---|---|---|---|---|
| R1 | 2.2kΩ | 5% | ¼W | |
| R2 | 4.7kΩ | 5% | ¼W | |
| R3 | 33Ω | 5% | ¼W | |
| R4 | 47Ω | 5% | ¼W | |
| R5 | 1kΩ | 5% | ¼W | |
| R6 | 1kΩ | | ¼W | Vermet type VA05V |
| R7 | 4.64kΩ | 1% | ¼W | |
| R8 | 10Ω | 1% | ¼W | |
| R9 | 90Ω | 0.5% | ¼W | |
| R10 | 900Ω | 0.5% | ¼W | |
| R11 to R26 | 22kΩ | 5% | ¼W | |

TRANSISTORS

Q1 BD-106 A ITT

Q2 BSY 84

Q3 BSY 84 or BSY 83 ITT or BFY 56 A SGS

TRANSFORMERS

T1 Inverter transformer P18259

T2 or T9 Isolating transformer P18258

## CONDENSATEURS

C1 tantale sec 3 µF 40V GPB
C2 tantale sec 10 µF 16V GPB1
C3 " " " " " "
C4 à
C21 " " 1 " 25V GPB2

## TRANSISTORS

Q1 BD-106 A ITT
Q2 BSY 84
Q3 BFY 56 A SGS

## DIODES

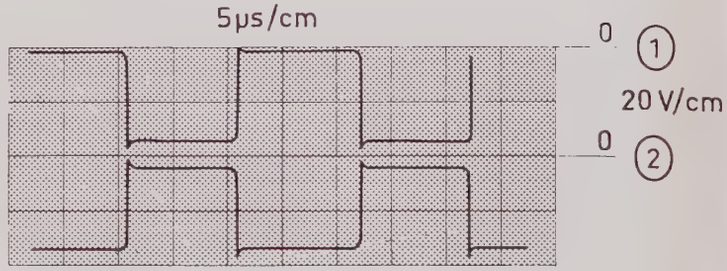
CR1 à
CR15 ITT 51 ou TF 51
CR16 ZENER ZF 15
CR17 ZENER IN 821
CR18 à
CR37 ITT 51 ou TF51

## TRANSFOS

T1 transfo. convertis. P 18 497
T2 à
T9 transfos d'isolement P 18 258

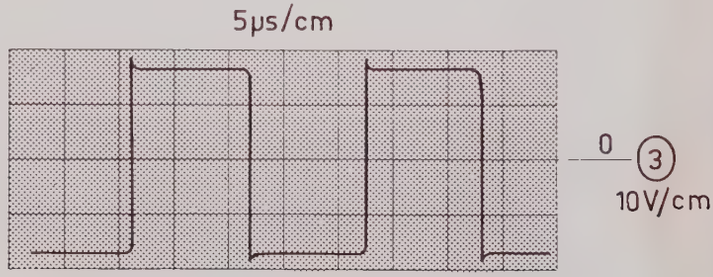
## INVERSEUR

S1 subminiature 50 MT profes.
bouton L8 Jeanrenaud

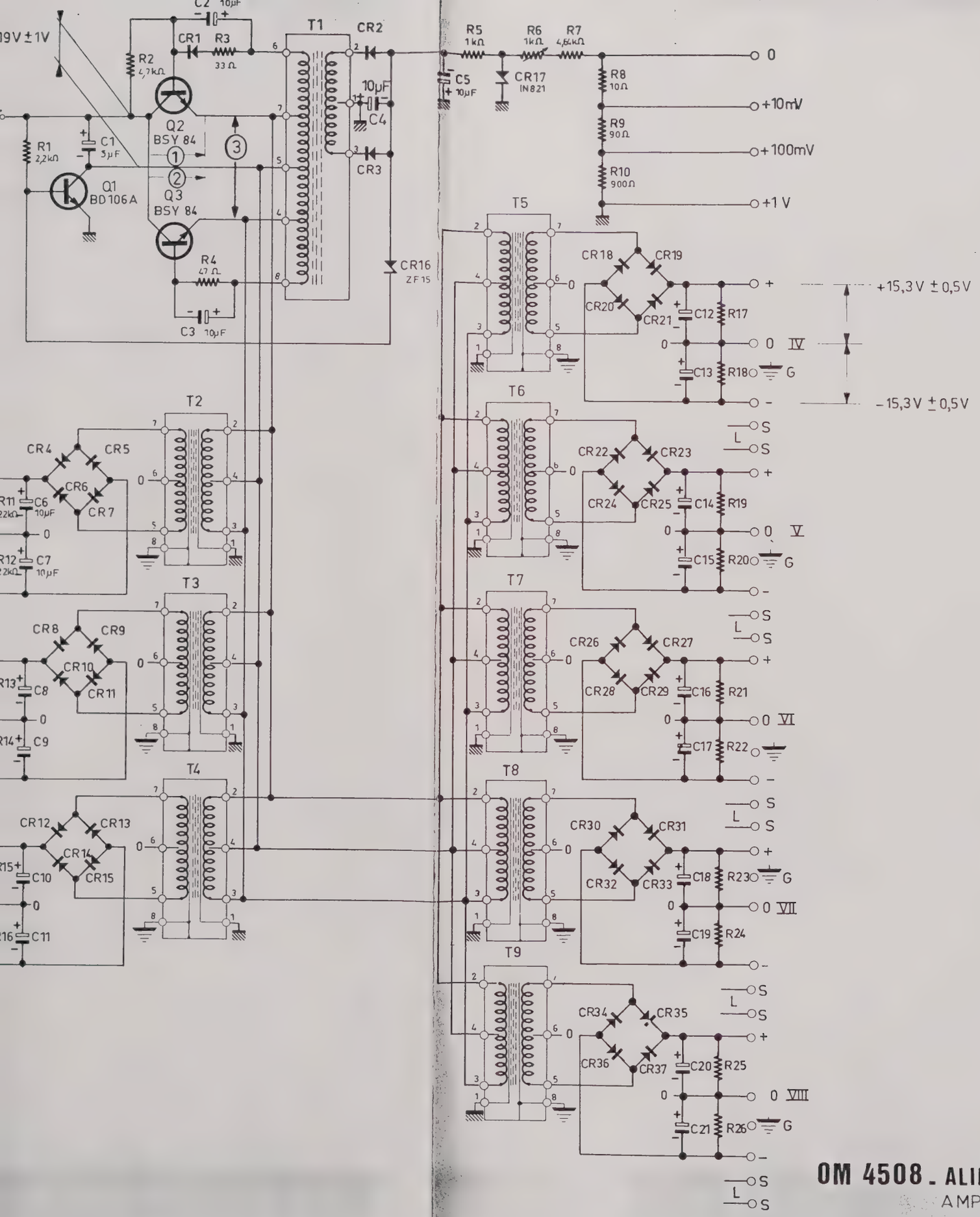



## RESISTANCES

R1 1/4 W 2,2 kΩ 5%
R2 " 4,7 kΩ "
R3 " 33Ω "
R4 " 47Ω "
R5 " 1kΩ "
R6 " 1 kΩ Vermet type VA 05V
R7 " 4,64 kΩ1%
R8 " 10Ω 1%
R9 " 90Ω 0,5%
R10 " 900Ω "
R11 à
R26 " 22 kΩ 5%

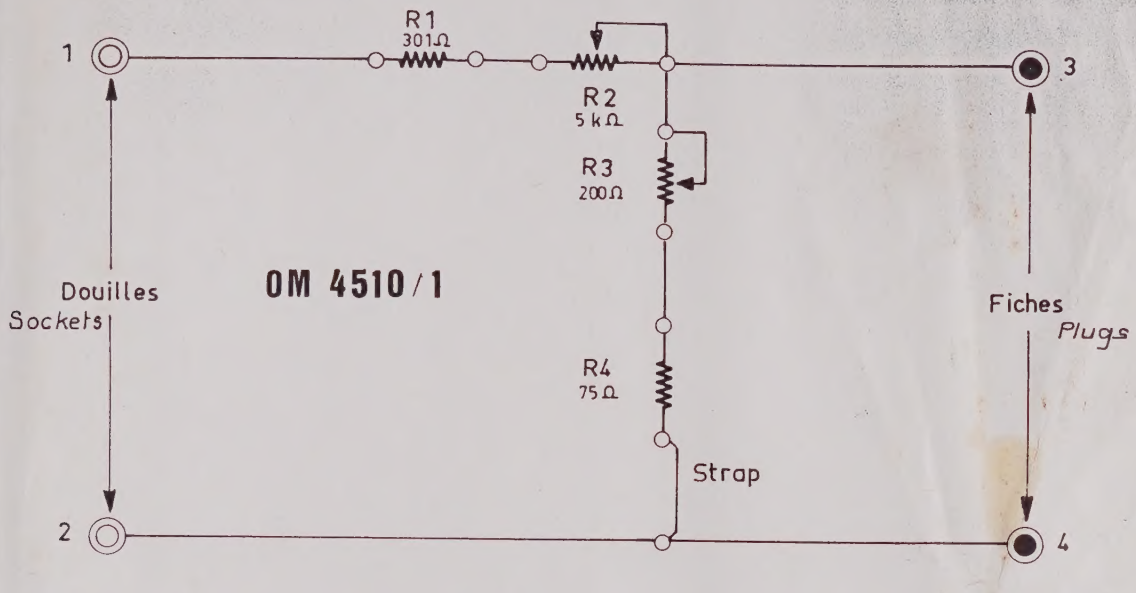


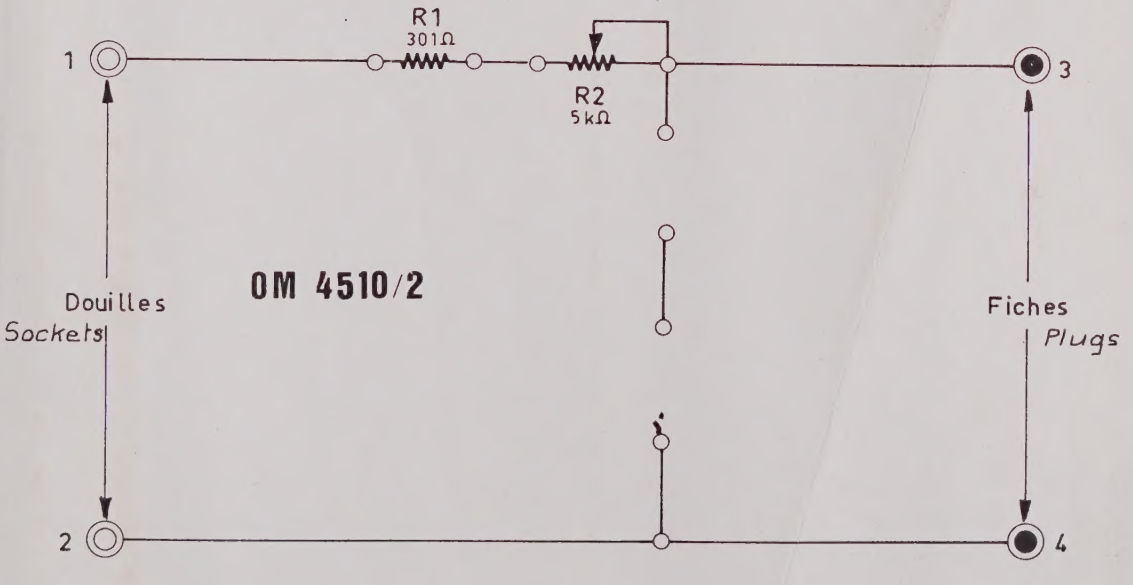

+24V
0V
+
I 0
G
-
S
S
L
+
II 0
G
-
S
S
L
+
G
III 0
S
S
L
-




**OM 4508 - ALIMENTATION AMPLIS**

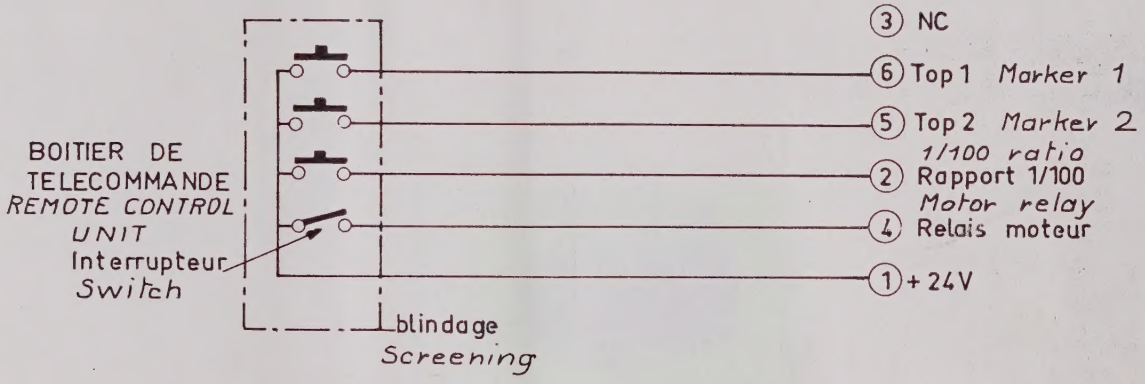
AMPLIFIER POWER SUPPLY

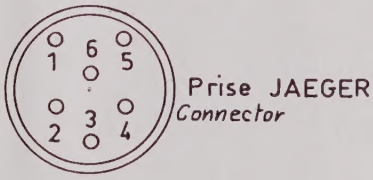



MATCHING UNIT

# OM 4510 - ADAPTATEUR




# OM 4511. BOITIER DE TELECOMMANDE

## REMOTE CONTROL UNIT

MP MASTER
MA24423